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## COMBINED CATALOGS



# Northeastern University

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COLLEGE OF LIBERAL ARTS

COLLEGE OF EDUCATION

COLLEGE OF BUSINESS ADMINISTRATION

COLLEGE OF ENGINEERING

COLLEGE OF PHARMACY

COLLEGE OF NURSING

BOSTON-BOUVÉ COLLEGE

UNIVERSITY COLLEGE

LINCOLN COLLEGE

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GRADUATE SCHOOLS

of

Arts and Sciences

Business Administration

Education

Engineering

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**1967-1968**  
**CATALOG**



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#### **Office Hours**

#### **INTERVIEW PERIODS**

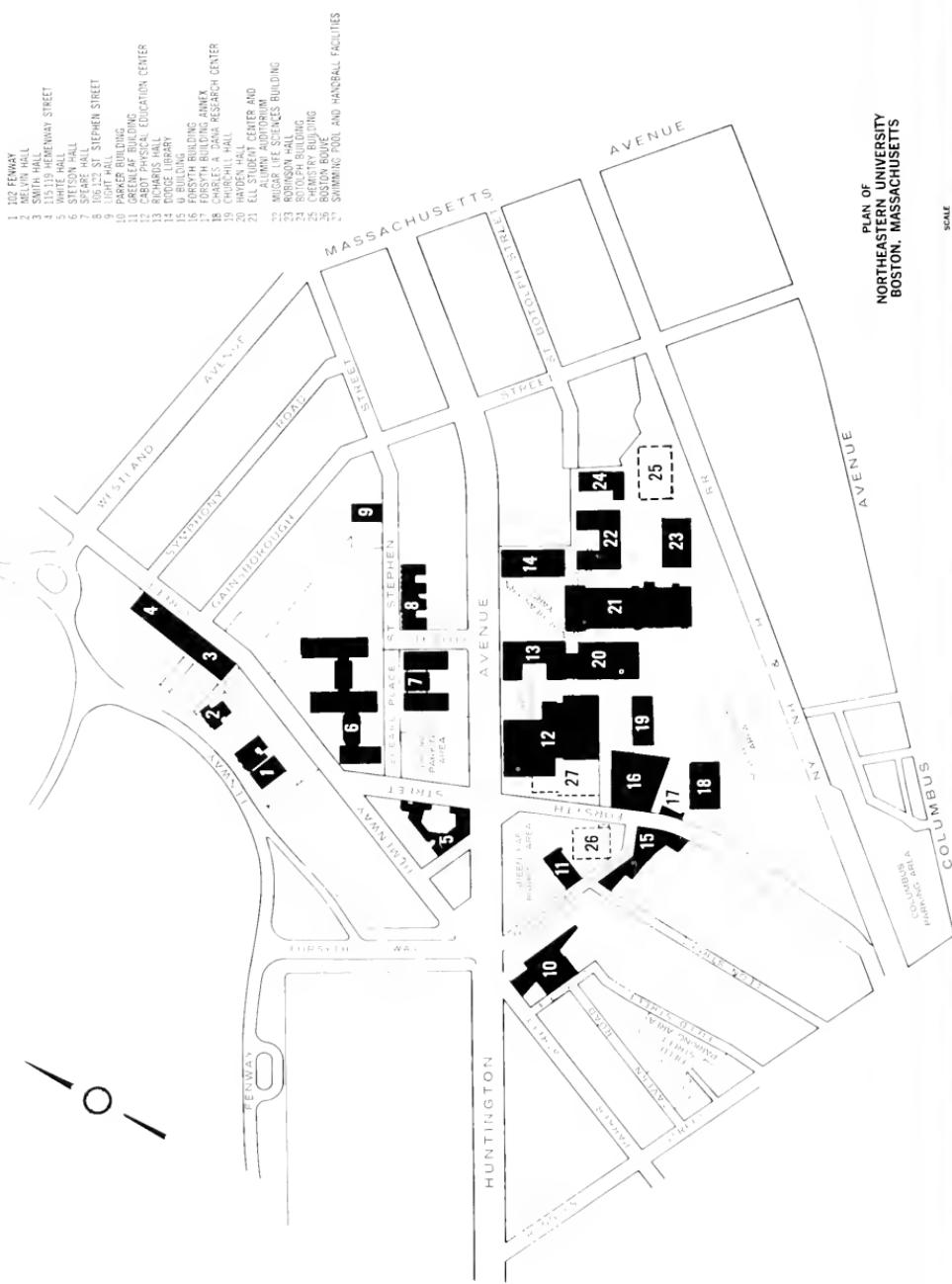
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Saturdays (by appointment)  9:00 A.M. - 11:30 A.M.  
Guided tours of the University are scheduled  
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- 4 151 TUXEDO DRIVE, STREET
- 5 THE HALL
- 6 STEPHEN HALL
- 7 STEPHEN STREET
- 8 106-122 ST. STEPHEN STREET
- 9 LIGHT HALL
- 10 PARKER BUILDING
- 11 GREENE HALL
- 12 GREENE HALL EDUCATION CENTER
- 13 GREENE HALL
- 14 DODGE LIBRARY
- 15 U-BUILDING
- 16 FISCHY BUILDING
- 17 FISCHY BUILDING ANNEX
- 18 CHARLES A. DASA RESEARCH CENTER
- 19 CHURCHILL HALL
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- 22 MUGLER LIFE SCIENCES BUILDING
- 23 RONINGTON HALL
- 24 ROTOLI BUILDING
- 25 CHEMISTRY BUILDING
- 26 BOSTON AVENUE SWIMMING POOL AND HANDBAL FACILITIES

SCALE  
0 100 200 300



## *The Governing Boards and Officers of the University*

- The Corporation
- The Board of Trustees
- General University Committees
- Officers of Administration





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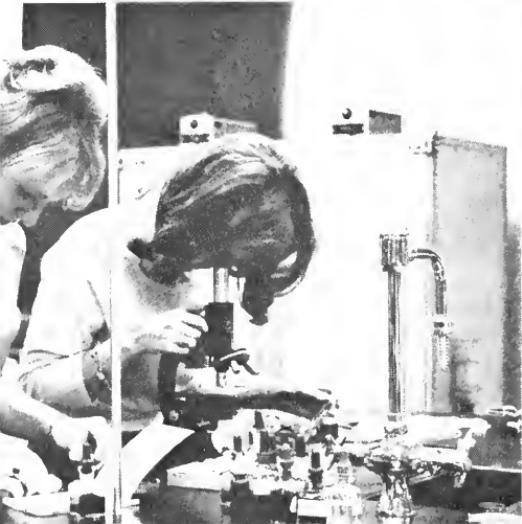
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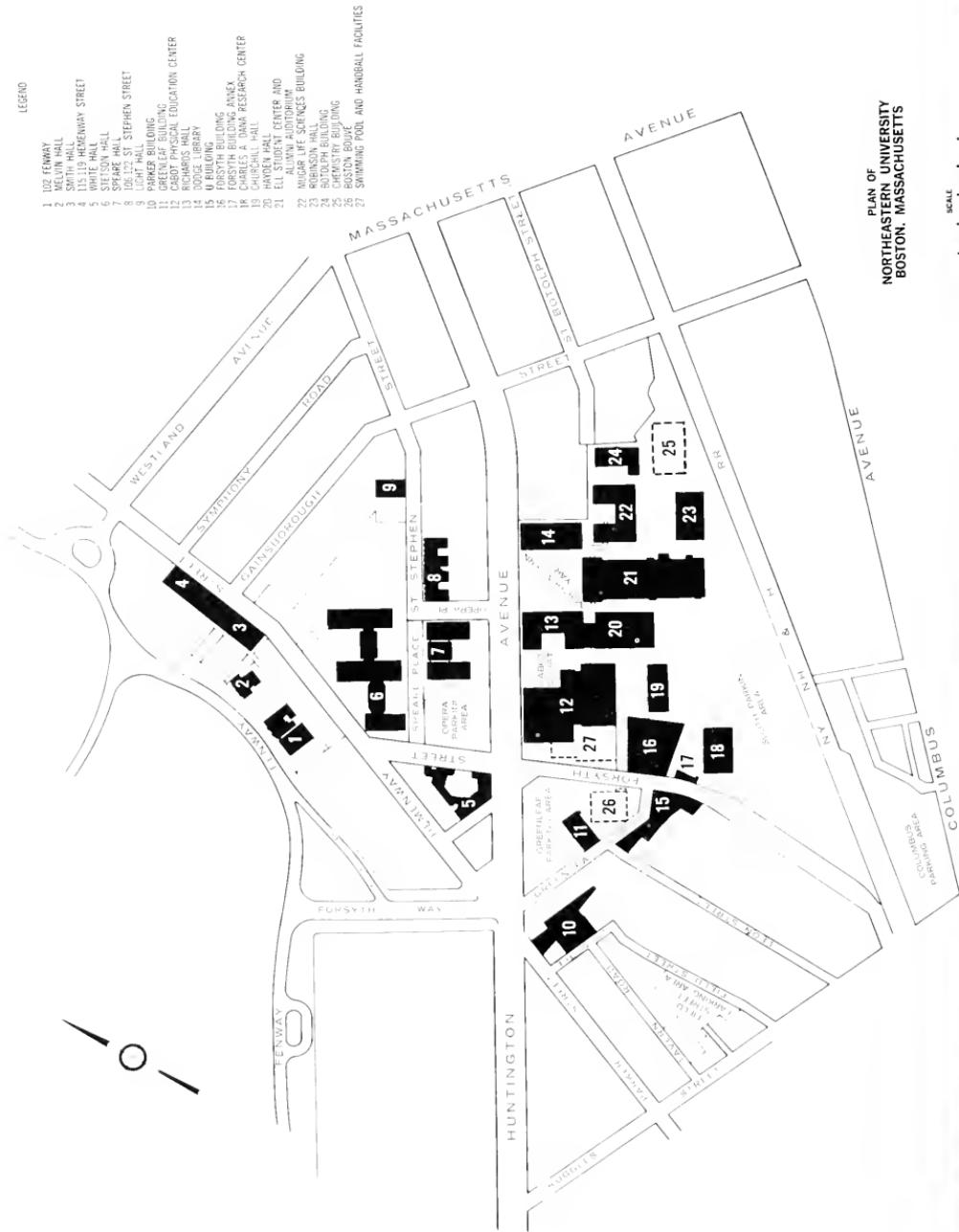


A  
*Pictorial*  
*Visit*



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- 2 MELVIN HALL
- 3 SMITH HALL
- 4 115 1/2 HENRICKSON STREET
- 5 SHIFFORD HALL
- 6 SPEARE HALL
- 7 106 1/2 ST. STEPHEN STREET
- 8 LIGHT HALL
- 9 PARKER BUILDING
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PLAN OF  
NORTHEASTERN UNIVERSITY  
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- The Corporation
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**Terms Expire 1969**

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### **Business Administration**

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Professor Richard Lindhe

Professor Wesley Marple

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Professor Robert J. Ferullo  
Professor E. Vaughn Gulo

### **Engineering**

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Professor Marcello J. Carrabes  
Professor James M. Feldman  
Professor Paul M. Pratt  
Professor Wilfred J. Remillard

Professor Arvin Grabel  
Professor Saul Namyet  
Professor Giuliano Sorani  
Professor Richard R. Stewart  
Professor Roy Weinstein

### **Liberal Arts**

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Professor Charles M. Goolsby  
Professor George Khiralla  
Professor Morton Rubin  
Professor Henry O. Werntz

Professor Walter L. Fogg  
Professor Norbert L. Fullington  
Professor Sidney Herman  
Professor Frank F. Lee  
Professor Harold Naidus

### **Nursing**

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Professor Goldie Crocker

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# *Aims and Scope of the University*

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Cooperative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), and the College of Criminal Justice (1967). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

The following is a brief outline of the aims and scope of the University's programs.

## UNDERGRADUATE COLLEGES

### BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study — Physical Education, Recreation Education, and Physical Therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Cooperative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Cooperative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Cooperative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate cooperative students as research assistants.

### COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Cooperative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

### COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Cooperative Plan, which provides for employment in libraries, social service agencies, and school systems.

## **COLLEGE OF ENGINEERING**

The College of Engineering offers five-year cooperative curricula in civil, mechanical, electrical, chemical, industrial and biomedical engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day cooperative curriculum, and meets the same qualitative and quantitative standards of scholarship.

## **COLLEGE OF LIBERAL ARTS**

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Cooperative Plan.

## **LINCOLN COLLEGE**

Lincoln College offers part-time evening programs leading to associate and/or bachelor's degrees in Allied-Medical Technology, Civil Engineering Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, and Science Technology. Additional programs in industrial, science, and allied-medical technology, leading to the Bachelor of Science degree, are offered in collaboration with University College.

## **COLLEGE OF NURSING**

The College of Nursing offers two separate and distinct programs of study, both organized on the Cooperative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable cooperative work opportunities during the upper-class years of these programs.

## **COLLEGE OF PHARMACY**

The College of Pharmacy offers five-year cooperative curricula leading to the degree of Bachelor of Science in Pharmacy. Cooperative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

## UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement and Security, and Health Care Administration, leading to the Associate in Science and Bachelor of Science degrees. Special-program certificates may also be earned, and workshops and seminars are offered for degree credit.

University College does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students who may be employed full-time or enrolled full time in professional schools affiliated with Northeastern University. In cooperation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

University College and Lincoln College offer a joint program in Medical Technology conducted in affiliation with a number of hospital schools of medical technology approved by the American Medical Association. Students receive a Bachelor of Science degree from University College, and they may write the examination for certification as a registered medical technologist (ASCP).

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

## GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

### ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

### ARTS AND SCIENCES

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, Psychology and Sociology.

### BUSINESS ADMINISTRATION

Master of Business Administration.

### EDUCATION

Master of Education.

### ENGINEERING

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's

degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

## **PHARMACEUTICAL SCIENCES**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

## **PROFESSIONAL ACCOUNTING**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

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Some of these programs are offered on the Cooperative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in Churchill Hall.

## **DAY PROGRAMS FOR ADULTS**

These programs were developed to meet the needs of adults with family or other obligations who wish to engage in part-time study during the day. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered.

## **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working cooperatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## AFFILIATED PROGRAMS

### FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in cooperation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

### FOR MEDICAL TECHNOLOGISTS

In cooperation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Cooperative Plan leading to the degree of Bachelor of Arts.

### FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

## THE DIVISION OF COOPERATIVE EDUCATION

The Division of Cooperative Education, under the direction of the Dean of Cooperative Education, administers service programs through three departments as follows:

### THE DEPARTMENT OF COOPERATIVE EDUCATION

Supervises all undergraduate cooperative students on their regularly scheduled work periods. This includes placement on job assignments as well as guidance and counseling designed to integrate the work experience into the student's total educational program.

### THE DEPARTMENT OF GRADUATE PLACEMENT SERVICES

Offers a placement service for all seniors and alumni of University degree-granting programs. Supervises the placement, guidance, and counseling of graduate students on the cooperative program.

### THE CENTER FOR COOPERATIVE EDUCATION

Provides a consulting service for other colleges and universities that are adopting the Cooperative Plan of Education. Develops research projects and publications concerning this method of education.

## RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are coordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



# *Buildings and Facilities*

The main campus of Northeastern University is located on Huntington Avenue in the Back Bay section of Boston, near the Fenway.

Many of Boston's famous cultural, educational, and philanthropic institutions are situated in the Back Bay, including the Museum of Fine Arts, Symphony Hall, Horticultural Hall, The Isabella Stewart Gardner Museum, the Harvard Teaching Hospitals, and many schools and colleges both public and private.

Northeastern University's 47-acre campus is divided by Huntington Avenue, with the educational buildings on the south side and dormitories on the north.

The main educational buildings, all of which have been completed since 1938, are of glazed-brick construction in the contemporary classic style. Most are interconnected with closed passageways so that students and faculty may move from building to building under shelter during the winter months.

Richards Hall, built in 1938, houses the main administrative offices of the University, contains some of the Chemistry laboratories and Mechanical Engineering laboratories and provides a number of classrooms and faculty offices.

The Mugar Life Sciences Building contains the College of Pharmacy and the Departments of Psychology, Biology, and Chemical Engineering.

Centrally located where it is readily accessible to students from all of the Colleges and the Graduate Division is the Dodge Library, operated upon an

open-stack plan and equipped to serve effectively the needs of the varied student bodies which comprise the Northeastern community. The Dodge Library is an official depository for government publications and documents.

The Carl S. EII Student Center provides facilities for student recreation and for extracurricular activities. The Alumni Auditorium, with a seating capacity of 1,300, is part of this building. Also included are special drama facilities, a ballroom, a main lounge, fine arts areas, student offices, conference rooms, meeting areas, and a student dining area seating more than 1,000 persons.

Hayden Hall provides the principal facilities of the College of Business Administration and the College of Liberal Arts. Its ground floor is occupied by the Department of Electrical Engineering. Headquarters of University College and Lincoln College, and the office of the University Registrar, are also located in Hayden Hall.

Churchill Hall contains administrative headquarters in the Graduate Division, houses the Departments of Earth Sciences and Philosophy, and also includes the faculty and staff cafeteria.

The Godfrey Lowell Cabot Physical Education Center is one of the best equipped in New England. It contains four basketball courts, an athletic cage, a women's gymnasium, and a rifle range, as well as administrative offices for the

New \$3,700,000 Student Center opened in the Fall of 1965.



Department of Athletics and for the Physical Education Department of Boston-Bouvé College.

Mary Gass Robinson Hall contains the offices of the College of Nursing; nursing, biology, and physical therapy laboratories; radio and TV facilities; lecture rooms; and classrooms.

The United Realty Building is the location of the offices of the Departments of Mathematics, Economics, Journalism, Sociology, and Industrial Engineering and research facilities for Biology, Chemistry, Psychology, and Mechanical Engineering.

The Dana Research Center houses research facilities for Physics and Electrical Engineering.

Three other buildings on the campus have been completely remodeled and reconditioned for educational purposes. These are the Botolph Building, which houses the Department of Civil Engineering; the Forsyth Building, in which are located the University Health Service, the planetarium and some of the Mechanical Engineering laboratories, and the Greenleaf Building, now used for research and for offices of the Department of Military Science.

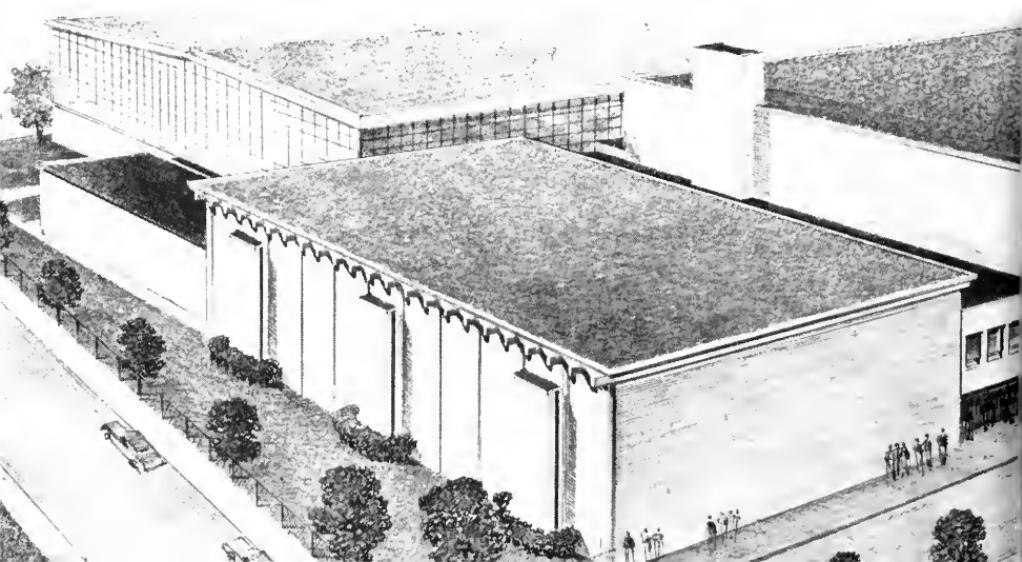
### New Facilities

Two physical education facilities are under construction on the Boston Campus. A five-story structure will house Boston-Bouvé administrative offices, classrooms, laboratories, and faculty offices, as well as a library, dance studio, and gymnasium.

An addition to the Cabot Center will contain a 105-foot swimming pool for instruction and intercollegiate competition, a practice tank for the rowing team, a weight room, handball courts, and shower and dressing facilities.

Ground was broken in the spring of 1967 for a \$3,000,000 chemistry building, which will contain classrooms and laboratories for undergraduates as well as special research facilities for graduate students and faculty. It will also house the departmental library as well as lecture halls and offices.

Architect's drawing of building which will house a swimming pool, handball courts, and practice tank for the crew. It will be ready for use by the fall of 1968.





Adjacent to the campus are parking areas for 2,400 automobiles.

Dormitory facilities accommodate 2,303 undergraduates — 1,226 men and 1,077 women. Living quarters will be provided for 426 more women when the addition to Stetson Hall is ready for occupancy in the fall of 1967.

(See page 4 for detailed map.)

### Off-Campus Facilities

Northeastern University operates one of the nation's finest off-campus centers for continuing education at Henderson House in Weston, Massachusetts, which is 12 miles from the main campus on Huntington Avenue.

The University conducts some of its courses at a Suburban Campus near Route 128 in Burlington, Massachusetts, and Northeastern's Center for Management Development uses facilities on the campus of Phillips Academy in Andover, Massachusetts.

Athletic facilities for football and baseball are located at Kent Field, Kent Street, Brookline.

One of the University's most beautiful off-campus properties is the Warren Center for Physical and Recreation in Ashland, Massachusetts. Located on the 200-acre site is a large balconied lodge and six woodland cottages. At various times during their academic program, Boston-Bouvé students will live at the Center to gain practical experience in camp leadership and outdoor education.

Northeastern has recently established a Marine Science Institute as a research and instructional facility primarily engaged in studies of Marine Biology and Oceanography. The Institute, operated year round, is located on East Point, Nahant, which is situated about 20 miles northeast of Boston on a promontory jutting out into Boston Harbor.

Suburban Campus — Burlington, Mass.



# *The Cooperative Plan*



## **What It Is**

The Cooperative Plan of Education is founded on the educational philosophy that supervised employment in the occupational field for which a student is preparing enhances comprehensive learning and vocational adaptation. It utilizes, in addition to the usual classroom and laboratory exercises, the learning situations of the workaday-world environment in industry, business, and the professions.

Cooperative education is a program in which students integrate classroom study with working experience at regular paying jobs.

It is not a system of part-time jobs; nor is it an institutionalized means of "working your way through college." It is a means of combining theory with practice.

What distinguishes cooperative education from the "earn-while-you-learn" concept is the fact that the work experience is carefully planned in terms of timing, supervision, placement, and advancement.

In 1960, the Study of Cooperative Education Committee, under the leadership of Dr. Ralph W. Tyler of the Center for Advanced Study in the Behavioral Sciences in California, completed a two-year, nation-wide analysis of Cooperative Education programs. The Committee reported that under this unique system of education the students find greater meaning in their studies, their motivation for academic pursuit is increased, they develop greater skills in human relations, their vocational guidance is improved, and through a reliance on their own judgments they achieve a maturity beyond their years.

The Cooperative Plan is particularly designed to serve the needs of the recent high school graduate rather than the older, more mature student, who already may have had considerable work experience.

All Northeastern cooperative curricula are five years in length, leading to the baccalaureate degree. In the Colleges of Engineering, Business Administration,

Liberal Arts, Education, Nursing, and Criminal Justice, and in Boston-Bouvé College, the program consists of a freshman year of three consecutive twelve-week quarters of academic study, followed by four upper-class years on the Cooperative Plan.

In the College of Pharmacy only three upper-class years are on the Cooperative Plan, with the senior year being one of full-time study at the University.

Girls in Boston-Bouvé College may elect a four-year program in which they participate in the Cooperative Plan during the sophomore year only. The curriculum in physical therapy is offered only on the four-year plan.

The College of Nursing offers a special three-year program leading to the associate degree. The first year consists of full-time study at the University followed by two years of alternating work and study under the Cooperative Plan.

### **How It Works**

The Cooperative Plan works in the following manner. Upperclassmen, including both men and women, are divided into two almost equal divisions, designated "A" and "B." Students in one division start the college year with a quarter of classroom work, while their alternates in the opposite division are on cooperative job assignments. At the end of the quarter the divisions change places. The two divisions alternate cooperative work with classroom work, so that each student spends two quarters in school and two quarters on "co-op" for each academic year.

During this time, the employer has full coverage of his job, and he looks upon the Cooperative Plan as a partnership between his organization and the college in a unique training program. The student gains valuable experience related to his field of study and earns a substantial part of his college expenses.

### **Faculty Coordinators**

Each student is assigned to a coordinator, who is responsible for all phases of the Cooperative Education program for his group of students. He interviews them during the freshman year, discusses with them various vocational objectives, and answers questions regarding the many activities of business, industry, and the professions.

He studies them in the light of their physical condition, scholastic attainment, interests, aptitudes, and other factors bearing upon their qualifications for vocational assignment. These interviews culminate in an agreement between the student and his coordinator regarding the cooperative assignment to which the student will be referred.

During each of the quarters at college immediately succeeding a quarter at cooperative work, the coordinator confers with the student concerning job experience and other matters relating to vocational adjustment or personal problems while on the job. In his reports the employer evaluates the achievement of the student. The faculty coordinator uses this information to guide the student toward his professional objective and to help him obtain maximum value from his education at Northeastern.

### **Placement**

The coordinator visits cooperating firms and arranges for the employment of students in his charge. The range of opportunities for Northeastern students

is wide, encompassing all the occupational fields for which they are preparing at the University. In general, the first year of cooperative work can be expected to be of a routine nature, testing fitness for more responsible work. A job assignment directly related to the student's field of study and consistent with his abilities, interests, and aptitudes, is the prime objective of the coordinator.

The jobs on which Northeastern students are employed are in no sense protected opportunities or purely observational assignments. They are regular jobs, performed under actual business conditions, and held in competition with other sources of supply, offering advancement on the basis of merit. The only privilege accorded Northeastern students is that of attending college on the Cooperative Plan.

Because of the uncertainties of the employment market, as well as other factors beyond its control, the University cannot and does not guarantee to place students. However, past experience has demonstrated that students who are willing and capable of adapting themselves to existing conditions are almost never without employment, except in periods of severe industrial depression.

### **Supervision and Guidance**

While the University does not adopt a paternal attitude toward cooperative work, it nevertheless assumes certain responsibilities toward students and cooperating firms. Coordinators visit regularly each job to which students in their charge are assigned. They solicit from the employer an oral report upon the student's progress and achievement. This supplements the written evaluation sent to the coordinator at the close of each work quarter. Any adjustments that may seem necessary or advisable are arranged at this time. Progress on assignments, schedules of training, advancement, and transfers to new responsibilities are discussed and evaluated.

Through a series of written reports prepared during their working periods, students are led to analyze their jobs and to develop a thoughtful and investigative attitude toward their environment. A most important phase of cooperative work is the opportunity afforded for guidance by the frank discussion of actual problems encountered on the job. The personal contact between coordinator and student is of great value in helping the student to get the most from the cooperative work assignment. While the University endeavors to provide every possible opportunity for its students, it expects them at the same time to take the initiative and to assume the responsibility for their individual development. To every student are available the counsel and guidance of the faculty, and every resource at its disposal; but the faculty does not coerce students who are uninterested or unwilling to think for themselves.

The Cooperative Plan is thus designed specifically to provide actual working opportunities which afford the students practical experience, give meaning to their program of study, and train them in reliability, efficiency, and teamwork.

### **Location of Work**

It is the policy of the University to assign students to cooperative jobs within commuting distance of their homes. This is not always possible, however, and at times it may be necessary for students to live away from home in order to obtain satisfactory and desirable cooperative work assignments.

## Types of Cooperative Assignments

All types of employers are represented among the 1,700 enterprises that employ Northeastern cooperative students. They include engineering firms, manufacturing companies, public utilities, government agencies, banks, railroads, insurance companies, wholesaling and retailing outlets, hospitals, social agencies, publishers, advertising houses, libraries, schools, and development and research organizations. Definite training schedules have been established with many of the cooperating employers. The ultimate objective of such schedules is absorption of the graduates into the permanent employ of the company, although such absorption is based on merit rather than guarantee.

Further details on the types of assignments available and the operation of the program are given in the booklet entitled "CO-OPportunities at Northeastern University," published by the University. This booklet may be obtained from the Department of Admissions.

## Value of Program

Cooperative education has a special appeal for students who understand the concept that working for an education is an important part of that education. These are students who appreciate the value of both observing the application of what they are learning and applying what is being studied in the classroom. Students who are majoring in sociology work in social agencies; journalism students work for book publishers and newspapers; accounting majors work in accounting; engineering students have assignments with electrical utility companies; and medical technology students take jobs in hospital laboratories. They all receive a superior quality of education because of the combination of classroom study and well-planned and meaningful on-the-job experience in their chosen fields.

Cooperative education also has a special appeal for those who need motivation, which is sometimes lacking when a student has a constant diet of classroom instruction. It has an appeal as well for those who are tired of just going to school. And it has practical appeal for the student with limited resources, because he can earn a large portion of his expenses through the regular pay he receives on his job assignment.

For girls, cooperative education has a special significance. They learn how to work under careful supervision, and even though they marry and discontinue their roles as members of the so-called working community, they will always have their experience to rely upon if it becomes necessary in later life to return to the field for which they trained.

Students know that they are receiving a superior education because they are sampling what they are learning. Moreover, they are learning how to get along with people and how to fit in — to be a part of a team in business, industry, government offices, social agencies, or the professions. They know, too, that when they graduate they have a good chance of remaining with their cooperative-program employers if they so desire. They know also that other employers in their chosen field will be eager to take advantage of their experience.

# ***General Admissions Information***

Applicants for admission to the freshman class must qualify by graduation from an accredited secondary school and must earn the recommendation of their principal or guidance counselor for the particular program to which they have applied. The most important single factor among the credentials submitted to the Committee on Admissions is the candidate's record of achievement in high school or preparatory school.

## **Application for Admission**

A combined Application for Admission and School Record form may be obtained by writing to the Department of Admissions, or may be secured at the time of the visit to the University. The Application for Admission should be filled out in ink, properly signed, and forwarded with a non-returnable \$15 fee to the Department of Admissions, Northeastern University, Boston, Massachusetts 02115. Checks should be made payable to Northeastern University.

## **Admission Plan**

Under Northeastern's admission plan, candidates may be notified of their acceptance as soon as the Committee on Admissions has received sufficient evidence to indicate the likelihood of success in study at the University. Each candidate is dealt with individually, and a decision is made as promptly as possible. Acceptances, therefore, may be issued early in the senior year, or after the College Board Aptitude Tests have been evaluated. Other candidates may necessarily wait until the results of Achievement Tests have been evaluated. The quality of the candidate's record through the junior year of high school and the schedule pattern of College Board testing dates have a direct bearing upon the candidate's acceptance date. In all cases, applicants for admission are required to complete successfully their senior year program of studies.

## **Entrance Examinations**

Northeastern requires both the Scholastic Aptitude Test and the Achievement Tests of the College Entrance Examination Board. All candidates write the English Composition Achievement Test. Two other Achievement Tests which must be written will be determined by the particular college or program of studies in which the candidate is interested. The Writing Sample may not be substituted for an Achievement Test.

The following may be referred to as a guide:

Fields of Study	Achievement Tests
Education (Physics, Mathematics) Engineering Liberal Arts (Physics, Mathematics)	English Composition Mathematics (Level I) Physics or Chemistry
Education (Biology, Chemistry) Liberal Arts (Biology, Chemistry)	English Composition A science Mathematics (Level I)
*Nursing Pharmacy	
Boston-Bouvé Physical Education — Women Physical Therapy	English Composition Science <div style="display: flex; align-items: center; gap: 10px;"> <div style="border-left: 1px solid black; padding-left: 10px; margin-right: 10px;">           Mathematics (Level 1)            or            Social Science         </div> <div style="flex-grow: 1;">           It is recommended that women students in Physical Therapy and Physical Education write the test in mathematics.         </div> </div>
Physical Education — Men Recreation Education	
Business Administration Criminal Justice Education (Elementary, English, Social Studies, Modern Languages, Speech and Hearing Therapy) Liberal Arts (non-science fields)	English Composition A choice of two other tests

\*Achievement Tests optional for the 3-year program

As a general rule, Achievement Tests should be written only in those subjects currently being studied.

Applicants for admission should complete the Scholastic Aptitude Test in May of the junior year, in July before the senior year, or in December or January of the senior year. The Achievement Tests may be completed in March of the senior year or earlier if so advised by an admissions counselor or by the school guidance department.

For full information about College Board Examinations the student should consult his high school guidance office or write directly to:

The College Entrance Examination Board  
P.O. Box 592  
Princeton, New Jersey 08540

Students on the West Coast should write directly to:

The College Entrance Examination Board  
Box 1025  
Berkeley, California 94701

### Candidates' Reply Date

An accepted student will be asked to submit a non-returnable tuition deposit of \$100 by April 1, 1968. This deposit serves as an indication of intention to enroll and is applied to the student's first-term tuition account. Resident students must make a non-returnable board-and-room deposit of \$100 by April 1.

### Specific Course Requirements

Applicants for admission to the freshman class must qualify by graduation from an approved course of study in an accredited secondary school. The actual subjects which are prescribed for admission vary somewhat according to the college and program in which the applicant enrolls. These specific requirements are given in the section of this catalog describing the individual colleges and their programs.

### Other Requirements

Formal requirements are necessary and desirable in that they tend to provide all entering students with a common ground upon which the first year of the college curriculum can be based. But academic credits alone are not an adequate indication of a student's ability to profit by a college education. Consequently, the Department of Admissions takes into consideration a student's interests and aptitudes, insofar as they can be determined, capacity for hard work, attitude toward classmates and teachers in high school, physical stamina and, most important of all, character. In this way the University seeks to select for its student body those who not only meet the academic admission requirements but who also give promise of acquitted themselves creditably in the rigorous program of training afforded by the Cooperative Plan of Education.

### The Interview

Students who are interested in attending Northeastern are cordially invited to visit the University. Arrangements have been made for a series of Admissions Conferences on Monday through Friday, except for legal holidays, at 10 a.m. and at 2 p.m. Included is a sound filmstrip describing Northeastern and the Cooperative Plan of Education. Candidates who have particular problems of a personal nature may talk with a counselor either before or after the group interview.

Guided tours follow the Admissions Conferences on weekdays at 11 a.m. and 3 p.m. Both should be scheduled in advance.

Because Northeastern does not hold classes for students in the Basic Colleges on Saturdays, applicants are urged to visit the University on a weekday.

Ordinarily, conferences with admissions personnel will be more helpful if candidates have studied the publications, "Adventures in Education" and "CO-OPportunities." These are mailed to those who express interest in Northeastern.

### Registration

Freshmen in the day programs will register at the Boston Campus on Tuesday, September 13, 1967; at the Burlington Campus, on Wednesday, September 14. Students are not considered to have met the requirements for admission until they have successfully passed the required physical examination. Registration must be in person.

## **ADMISSION OF TRANSFER STUDENTS**

A student wishing to transfer into the Basic Colleges of Northeastern University may request advanced standing as an upperclassman on the basis of acceptable credits earned in an accredited two- or four-year institution or a technical institute.

### **Basic Requirements**

Full details of the University's transfer policy are available from the Department of Admissions upon request. Following are the basic requirements:

1. Only a candidate who presents satisfactory college records may be considered for advanced credit (cumulative average of C+). No credit is given for the lowest passing mark.
2. Credit is given for those courses which are the equivalent of required subjects offered in the particular college at Northeastern. Credit may also be given for elective courses.
3. Candidates must be in good standing and eligible to continue in the institution they are currently attending.
4. Evidence of honorable dismissal and satisfactory health are required. (Appropriate forms will be sent.)
5. Special student status is not possible in any of the Basic Colleges of Northeastern.

### **Application Procedure**

An applicant for advanced standing is required to:

1. Complete an application for admission no later than May 1 of the year of intended entrance. Transfer students are admitted only in September.
2. Submit a transcript of his high school record.
3. Request that an official college transcript of his completed courses be sent, as well as a list of courses which will be completed prior to the end of the academic year.

NOTE: Transfer students are not required to take College Board Tests.

All records must be received by the Department of Admissions no later than June 15 of the year of intended entrance. Upon receipt of all items required, the candidate will be notified of the action taken.

### **Financial Aid**

A number of scholarships, loans, and grants are available to qualified transfer students.

Candidates must submit an application to the Office of Financial Aid and file a Parents' Confidential Statement with the College Scholarship Service, Box 176, Princeton, New Jersey, no later than May 1.

Further information may be obtained from the Office of Financial Aid.

### **Outline of Freshman Courses**

The first year is a period of full-time study during which the student must demonstrate fitness for the program which has been elected. For students enrolled in the Colleges of Liberal Arts, Education, Business Administration, Criminal Justice, Engineering, Pharmacy, Nursing, and Boston-Bouvé College, the Cooperative Plan of training on the job begins with the second year. Students who are unsuccessful in the basic courses of the freshman year will not be permitted to continue with their advanced program, but will be advised to change their goal and type of training. In some instances this will mean change to another curriculum at Northeastern; in others, withdrawal from the institution. The freshman courses are so arranged as to permit change of objective during or at the end of the first year with a minimum loss of time.

# *College Expenses*

## **Tuition**

Freshman — The charge for tuition for all freshmen attending the Huntington Avenue and Burlington campuses is \$440 per quarter.

Engineering Upper-Class Students — The charge for tuition for all Engineering upperclassmen is \$600 per quarter.

Liberal Arts, Education, Business Administration, Pharmacy, Boston-Bouvé and Nursing Upper-Class Students — The charge for tuition for all upperclassmen is \$575 per quarter.

Student Teaching — The charge for student teaching in the College of Education is \$287.50.

Boston-Bouvé College — The charge for full-term Supervised Student Teaching in Physical Education, Supervised Field Experiences in Recreation, and Supervised Clinical Practice is \$287.50.

## **Schedule of Tuition Payments, 1967-1968**

### **For Freshmen**

Date of Payment	Tuition
September 12, 1967 .....	\$440
December 11, 1967 .....	440
March 18, 1968 .....	440

**For Upperclassmen (Cooperative Plan)**

DIVISION A	Tuition Engineering	Tuition Liberal Arts, Education, Nursing, Business Administration, Criminal Justice, Pharmacy, and Boston-Bouvé
September 18, 1967 .....	\$600 .....	\$575
March 18, 1968 .....	600 .....	575
DIVISION B	Tuition Engineering	Tuition Liberal Arts, Education, Nursing, Criminal Justice, Business Administration, Pharmacy, and Boston-Bouvé
December 11, 1967 .....	\$600 .....	\$575
June 17, 1968 .....	600 .....	575

**Full-Time Plan**

Certain students in the College of Liberal Arts may elect non-cooperative full-time programs. Tuition rates are the same as for students on the Cooperative Plan, and payments are due on the corresponding dates.

**Tuition Deposit**

Applicants accepted for admission must upon request pay a non-returnable tuition deposit of one hundred dollars (\$100) as evidence of their intention to enroll, and this will be applied on their first tuition payment.

**Payment of Tuition**

All payments should be made at the Bursar's Office. Checks should be made payable to Northeastern University. Students are not eligible to attend classes beginning with the second week of any quarter unless their tuition has been paid or specific arrangements have been made with the Bursar for a plan of deferred payment. Deferred payment of tuition entails a fee of two dollars (\$2).

**Late-Payment Fee**

A fee of five dollars (\$5) will be assessed for failure to make or arrange for payments in accordance with the prescribed regulations.

**Accident and Sickness Insurance**

The University provides an excellent hospital insurance and student health program. All students will pay a non-refundable University Health Services fee of \$18 per year. This fee will cover the group Blue Cross-Blue Shield program and the medical services which are provided to students by the University Health Service.

**Laboratory Deposits**

Freshmen taking chemistry make a Chemical Laboratory deposit of \$15 at the beginning of the year from which deductions are made for breakage, chemicals, and destruction of apparatus in the laboratory.

Upperclassmen taking chemistry laboratory work make deposits at the beginning of each such quarter as follows:

Sophomores and Middlers	\$15
Juniors	15
Seniors	20

Upperclassmen in Pharmacy take laboratory work and must make deposits at the beginning of each quarter as follows:

Middlers, Juniors, and Seniors	\$15
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### Reserve Officers' Training Corps — Uniform Deposit

Freshmen enrolling in ROTC make a deposit of \$10 to cover loss of or damage to ROTC uniform and equipment. Any loss or damage exceeding the deposit will be charged to the student.

### Student Center Fee

All students in the Basic Colleges on the Huntington Avenue campus are charged a fee of \$12.50 per quarter for the services available in the Student Center building.

### Application Fee

A fee of \$15 is required when the application for admission is filed. This fee is non-returnable.

### Late Registration Fee

A fee of \$5 will be charged for failure to register in accordance with prescribed regulations on the dates specified in the college registration bulletins. Registration must be made in person.

### Graduation Fee

A fee of \$25 covering graduation is required by the University of all candidates for a degree. This fee must be paid before the end of the fifth week of the last scholastic quarter in the senior year.

### Estimated College Expenses for a Freshman (Boston Campus)

The following data, compiled from expense returns submitted by the student body, give an idea of freshman expenditures under ordinary conditions:

Application Fee	\$ 15.00
*Tuition	1,320.00
Chemical Laboratory Deposit (for those taking chemistry)	15.00
Books and Supplies	75.00
Health Services Fee	18.00
ROTC Deposit (for those electing ROTC only)	10.00
Student Center Charge	37.50
	<hr/>
	\$1,490.50

(Engineering students should add approximately \$50 for drawing instruments and equipment.)

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\*This covers the first three quarters. Pharmacy students have a six-week period included as part of their freshman-year program. Tuition for this period is \$220. Students in Physical Education (Women) and Recreation Education have

## Living Expenses for Freshman Year

For freshmen residing away from home, living expenses for Orientation Week and the 36-week freshman year total \$1,221 on a seven-days-a-week basis. The cost of residence is \$429 for the first quarter, including Orientation Week, and \$396 each for the second and third quarters. In addition, resident students must pay an Infirmary fee of \$10 per term. Payment is due on the dates appearing in the tuition schedule above. Tuition rates and fees are subject to revision by the Board of Trustees at any time.

Students should allow an additional amount for clothing, incidentals and personal expenses. This amount will vary with individual tastes and spending habits.

## Refunds

The general policy in all Schools and Colleges of the University with respect to refunds of tuition to students is as follows:

The University provides all instruction on an academic Quarter basis for which students pay at the beginning of each Quarter. Tuition refunds will be granted through the first four weeks of a Quarter only when specific conditions are met. Questions regarding refunds should be discussed with the Dean of Students' Office.

Tuition refunds will be granted only on the basis of the date appearing on the official withdrawal application when filed with the Registrar. Non-attendance does not constitute official withdrawal.

Refunds will be granted in accordance with the following schedule:

### Amount of Refund:

Official Withdrawal Filed Within:	Percentage of Tuition
1st week of Quarter	100%
2nd week of Quarter	75%
3rd week of Quarter	50%
4th week of Quarter	25%

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short-term, summer camp leadership and outdoor education courses. Charge per term, including prorated tuition, living accommodations, and food, approximates \$200.

# *Financial Aid*

## **SCHOLARSHIPS FOR FRESHMEN**

Students interested in applying for freshman scholarships, loans, and employment may obtain detailed information from the Freshman Catalog.

### **Alumni Scholarships**

All Colleges

Four full-tuition scholarships for an entering freshman in each of the Basic Colleges are awarded annually by the Northeastern University Alumni Association through the generosity of donors' gifts to the Alumni Fund.

Applications are open to graduating high school seniors showing evidence of scholastic achievement and financial need.

An equal amount of scholarship assistance is granted by the Alumni Association to students enrolled in University College.

### **Henry B. Alvord Memorial Scholarships in Civil Engineering**

Engineering

Established in 1940 in memory of the late Henry B. Alvord, Professor of Civil Engineering and Chairman of the Department for eighteen years, the award is made annually to a student graduating from an accredited secondary school who demonstrates superior academic ability and gives promise of succeeding in civil engineering. The grant of \$250 is made only to an entering freshman who is qualified for and plans to study civil engineering.

### **Armstrong Rubber Company Scholarships**

All Colleges

Established in 1960, the Armstrong Rubber Company of West Haven, Connecticut, offers annually a scholarship in the amount of \$1,800 to a qualified boy or girl admitted to the University for a full-time program of study. Although children of Armstrong Company employees are given preference, any student residing in New Haven County is eligible to apply.

Recipients of the scholarship will participate in the University's Cooperative Program and will be expected to spend at least four periods of student employ-

ment with the firm. Scholarship applications are available from the Company upon request and should be returned to the Personnel Office no later than April 30 of the year in which the student plans to enter the University.

### **Badger Company, Inc. Grant Program**

Engineering

The Badger Company, Inc., has made available to Northeastern University two grants of \$1,200 each to be given to first-year students. Recipients must be from the secondary schools in the Greater Boston area who have been accepted into the College of Engineering. Summer employment shall be available to the recipient(s) of the grant during the summer before his matriculation at the University; and cooperative work will be offered as long as positions are available, during his undergraduate years.

### **Board of Higher Education Scholarships**

All Colleges

This program was established in 1957 by the Commonwealth of Massachusetts to provide scholarship aid to Massachusetts students pursuing full-time day schedules in accredited collegiate institutions. Awards are made in the fall of each year, and applications for freshmen are available through their high school guidance counselors.

### **The Godfrey L. Cabot Scholarship Fund**

All Colleges

This fund was established by Dr. Cabot in 1954 in order to help meet the college expenses of employees or children of employees of Godfrey L. Cabot, Inc., and its subsidiary and associated companies. To be eligible, the employee must have completed at least five years of service to the company prior to the time the student enters the University. The University shall determine the number and amount of these scholarships, which are not limited to outstanding students and which are available to evening as well as day students. Students interested in applying for scholarship aid from this fund should communicate with the Cabot personnel office or the Office of Financial Aid at Northeastern University.

### **The Gardner A. Caverly Scholarship**

All Colleges

This scholarship was established in 1957 through the generosity of Mr. Gardner A. Caverly, an alumnus of the College of Business Administration and a member of the Class of 1934. Its purpose is to provide financial assistance and encourage qualified students from the New England area to attend Northeastern University. In selecting worthy students for these scholarship awards, preference is given to graduates of the Rutland, Vermont, and Laconia, New Hampshire, high schools.

### **Community Scholarships**

All Colleges

The Community Scholarships were established by President Asa S. Knowles in 1963. Northeastern will grant scholarships in the amount of \$500 to qualified students from the following communities: Ashland, three scholarships; Boston, twelve scholarships; Burlington, three scholarships; and Weston, three scholarships.

### **The Cotrell Company Engineering Scholarship**

Engineering

In 1961, The Cotrell Company of Westerly, Rhode Island, established an annual scholarship of \$1,000 to be awarded to a senior in the upper fourth of

his class attending a high school in the Westerly area or to a senior in any high school who is the son of an employee of The Cotrell Company. Selection preference will be given to sons of employees and to students who have a long-range interest in the specialized fields of mechanical, electrical and industrial engineering.

### **The William O. DiPietro Scholarship**

**Engineering**

This scholarship was established in 1967 through the generosity of Mr. William O. DiPietro, a distinguished Alumnus of the College of Engineering and a member of the Class of 1942. The scholarship is awarded annually to one or more deserving freshmen who demonstrate a high caliber of achievement and a desire to fulfill the limits of their ability in both academic and cooperative periods of study. In considering recipients for this scholarship, preference is given to freshmen enrolled in the College of Engineering desirous of majoring in Chemical Engineering. It is intended that those students receiving awards from this scholarship might someday contribute to this or other scholarships themselves, thereby perpetuating growing funds that will help other deserving individuals.

### **Educational Opportunity Grants**

**All Colleges**

As part of the federally supported programs administered by the University, Educational Opportunity Grants will be available to a limited number of undergraduate students with exceptional financial need who require these grants to attend college. To be eligible, the student must also show academic or creative promise.

Eligible students who are accepted for enrollment or who are currently enrolled in good standing, may receive Educational Opportunity Grants for a maximum of four years of their higher education.

Grants will range from \$200 to \$800 a year, and can be no more than one half of the total assistance given the student. As an academic incentive to students, an additional award of \$200 may be given to those students who were in the upper half of their college class during the preceding academic year.

### **Carl Stephens EII Alumni Scholarships**

**All Colleges**

To honor Dr. Carl Stephens EII, the second president of Northeastern University, the Alumni Association, in 1958, established these scholarships. Either freshmen or upperclassmen enrolled at the University are eligible. Awards will be made to worthy students on the basis of scholastic ability and need. The scholarships are to be distributed as equitably as possible among students in the Basic Colleges and University College. Preference shall be given to sons and daughters of Northeastern Alumni.

### **Elmer H. and Daisy M. Everett Scholarship**

**All Colleges**

The purpose of this fund, established in 1961, by Mr. and Mrs. Elmer H. Everett, is to provide scholarship aid for a qualified entering freshman or upper-class student who will receive the greatest benefit from this assistance. The scholarship, to be awarded annually, will be equal to one-half tuition for a full academic year.

Preference will be given to a worthy student who is a member of, or the son or daughter of a member of, the Carter Memorial Methodist Church of Needham Heights, Massachusetts, or to another student suggested by the minister of this church. Should there be no qualified candidate available from the above source, then the scholarship shall be awarded to any worthy boy or girl.

**General Motors Scholarship**

All Colleges

General Motors has a vital interest in higher education in America. Under its "College Plan," one five-year scholarship is granted to a high school senior of high ability who has been admitted to one of Northeastern's Basic Colleges. The selection is made from among all students accepted for admission. A special application is not required.

**College of Nursing Scholarships**

Nursing

Scholarships are made available to students in the College of Nursing through a fund established by contributions from Northeastern University, Permanent Charities Fund, Massachusetts General Hospital, Children's Hospital Medical Center, Beth Israel Hospital, New England Deaconess Hospital, and Peter Bent Brigham Hospital. The application procedures and qualifications for selection are the same as those for all other scholarships.

**Charles Hayden Memorial Scholarships**

All Colleges

The Charles Hayden Foundation, created by the will of the late Charles Hayden, an alumnus of the Boston English High School, offers annually memorial scholarships to freshmen at Northeastern University. The scholarships are awarded to "deserving boys" whose parents are unable to finance the entire cost of their education.

**Regional Scholarships**

All Colleges

Secondary school students who do not reside within normal commuting distance of Northeastern University, who have demonstrated superior achievement in their studies, and who are strongly endorsed by their principals and guidance officers, may qualify for a Regional Scholarship. Scholarships range in amount from \$1,000 to \$2,400. Recipients are required to live in University-sponsored residence halls.

**Clinton H. Scovell Scholarships**

Boston-Bouvé

Scholarships are made available annually to women students in Boston-Bouvé College through a fund provided by the will of Clinton H. Scovell.

**The Sidney L. Sholley Memorial Scholarships**

All Colleges

The Sidney L. Sholley Memorial Scholarships have been established by the Trustees of the Keystone Charitable Foundation in memory of Mr. Sidney L. Sholley, founder and first president of the Keystone group of mutual funds. Two scholarships of \$600 each will be awarded annually to incoming freshmen. Recipients of the scholarships will be known as the Sidney L. Sholley Scholars.

**The Northeastern University  
Faculty Wives Scholarship**

All Colleges

Each year the Northeastern University Faculty Wives Club offers a half-tuition-scholarship to a young woman of limited financial resources who has demonstrated a likelihood of succeeding in her chosen professional field.

**Trustee Scholarships**

All Colleges

Established in 1928 by the Board of Trustees of Northeastern University, these full- and partial-tuition scholarships are granted in the eight Basic Colleges each year to entering freshmen who have demonstrated superior scholastic attainment throughout their preparatory or high school courses.

**AWARDS FOR FRESHMEN****Power Systems Engineering Grants-in-Aid      Electrical Engineering**

A number of public utilities and power equipment manufacturing companies in the northeastern part of the United States have made available grants-in-aid ranging from \$1,000 to \$1,800 to assist able freshmen who are planning to undertake the six-year integrated cooperative program in power system engineering leading to the degrees of Bachelor of Science and Master of Science in Electrical Engineering. These awards are made on the basis of academic achievement in high school and aptitude for and interest in the field of power systems engineering, without regard to financial need.

Candidates for such grants-in-aid should apply to the Dean of Admissions at Northeastern University not later than March 1 of the year in which they wish to enter the College of Engineering.

**SCHOLARSHIPS FOR UPPERCLASSMEN****Dr. Martin E. Adamo Scholarship**

Pharmacy

This scholarship of \$100 is given annually by the Boston Association of Retail Druggists in memory of Dr. Martin E. Adamo, the second president of the New England College of Pharmacy.

**American Foundation for Pharmaceutical Education  
Scholarships**

Pharmacy

The Board of Grants of the American Foundation for Pharmaceutical Education provides three scholarships of \$200 each to be awarded to junior or senior students on the basis of scholarship and financial need with the understanding that the University will match the awards to the students selected. The use of the funds is restricted to the payment of tuition and laboratory fees.

**The Boston Section of the American Society for  
Quality Control Scholarship**

All Colleges

This annual award was established in 1961 by the Boston Section of the American Society for Quality Control to provide assistance to a student enrolled in a collegiate program which will prepare him for a constructive

career in the broad field of quality control. The recipient must have completed his second year; and in his education or work experience, he must have demonstrated an interest in the broad field of quality control.

The Boston Section has an extensive educational program for those whose work requires an increasing knowledge of quality control, and it is active in enhancing the standards in this field.

### **The Henry Francis Barrows Scholarships** All Colleges

Established in 1949, the four Henry Francis Barrows Scholarships provided under the will of Fanny B. Reed, are offered to Protestant young men, born and brought up in New England. Good scholastic standing, good character, and need must be demonstrated by recipients of the scholarships.

### **The Mr. and Mrs. Emil Matthew Bauer Fund**

The interest from the Fund, established in 1954, is used for scholarships or other financial assistance to students of German birth or of German extraction studying at Northeastern University. The scholarships are available to either men or women students enrolled in any year at the University.

### **Board of Higher Education Scholarships** All Colleges

This program was established in 1957 by the Commonwealth of Massachusetts to provide scholarship aid to Massachusetts students pursuing full-time day schedules in accredited colleges. Awards are made in the fall of each year, and applications for upper-class students are available during April in the Office of the Director of Financial Aid for Students.

### **The Boston Paper Trades Association, Inc., Scholarship** Business Administration

Established in 1966 by the Boston Paper Trades Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by his cooperative work achievement and his extracurricular activities an interest and potential in the field of sales. The recipient shall also be a student who has financial need, a good academic record, and high character.

### **The Boston Rubber Group Scholarship** Chemistry, Chemical Engineering

This scholarship, established in 1962, is to be awarded in whole or in part to one or more chemistry or chemical engineering cooperative students on the basis of merit, need, scholarship, and personal qualifications. The Boston Rubber Group is sponsored by the Division of Rubber Chemistry, American Chemical Society.

### **Boston Society of Civil Engineers Scholarship in Memory of Desmond FitzGerald** Civil Engineering

In 1931 the Boston Society of Civil Engineers established a scholarship in memory of Desmond FitzGerald, a former president of the Society and an eminent hydraulic engineer with a distinguished record of service.

It has been awarded annually since 1931 to an outstanding Northeastern University senior or junior student in the Department of Civil Engineering of the College of Engineering. The presentation is made by the President of the Boston Society of Civil Engineers at the Society's annual meeting in the spring of the year.

**Brookline Hospital Women's Auxiliary Scholarships** Nursing

These scholarships, two \$1,000 awards, are available to upper-class nursing students, with preference being given to residents of Brookline. Selection is on the basis of good academic standing and demonstrable financial need.

**Martin Brown Scholarship Fund** Electrical Engineering

This scholarship was established in 1961 by Mr. Martin Brown, an engineering alumnus of the Class of 1921. The purpose of this scholarship is to assist qualified students enrolled in electrical engineering who have need and who have demonstrated above-average scholastic ability.

**Wellington Burnham Fund** All Colleges

This fund provides financial assistance to worthy students of limited means without discrimination as to race, creed, color, or scholastic attainment. It was established in 1961 under the provisions of the will of George A. Burnham.

**The William M. Cavanaugh Memorial Scholarship** All Colleges

This award, established by the members of the Publicity Club of Boston, is open to men and women of the Junior and Senior classes who demonstrate talent in the field of communications. The scholarship of \$100 bears the name of the second president of the Publicity Club (1950-1951) who fulfilled the role of an able and successful newspaper man.

**Chemical Club of New England** Chemistry, Chemical Engineering

To promote interest in the chemistry or chemical engineering field in New England, the Chemical Club of New England has made generous scholarships available to junior and senior students who are majoring in chemistry or chemical engineering and who show promise of success in either field.

Recipients of these scholarships must be residents of New England and must have financial need, above-average grades, and a good cooperative work record.

**Civil Engineering Department Award** Civil Engineering

The Civil Engineering Department Award was established by members of that department in order to recognize achievement and to give financial assistance to a student who has elected to major in the field of civil engineering. This award, in the amount of \$100, is financed by gifts from members of the Civil Engineering Department and is awarded to the recipient at the beginning of his sophomore year.

**Connecticut Alumni Club Scholarships** All Colleges

Each year the Connecticut Alumni Club awards scholarships to students from the state of Connecticut who have achieved a high academic average in their freshman year and have demonstrated financial need. The scholarships are to be used toward the tuition expense of the sophomore year. These scholarships were established in 1958 to promote Northeastern University among the preparatory schools of Connecticut.

**John W. Dargavel Foundation Scholarship** Pharmacy

This scholarship was established in 1964 by the John W. Dargavel Foundation, sponsored by the National Association of Retail Druggists. The award is limited to students who have completed their sophomore year in the College of Pharmacy.

**Electrical Manufacturers Representatives Club of New England, Inc., Scholarship** Electrical Engineering

Established in 1958, this scholarship of \$475 is granted to a student or students majoring in electrical engineering, without regard to race, creed, or color. To qualify students must have real financial need and excellent scholastic standing.

**Carl Stephens EII Alumni Scholarships**  
**Elmer H. and Daisy M. Everett Scholarship**

(For description of these two scholarships, see page 36.)

**Luis de Flores Endowment Fund** All Colleges

This fund was established in 1964 to provide yearly awards to students in recognition of superior ingenuity which a recipient shall have exhibited, irrespective of the general academic standing of the recipient.

**Clara and Joseph F. Ford Scholarship** All Colleges

In 1947 friends and employees of Clara and Joseph F. Ford united to provide tuition scholarships for worthy, needy, and well-qualified students who have demonstrated a democratic and tolerant spirit and who are well disposed toward people of all creeds and races.

**Gilman Brothers Inc. Scholarship** Pharmacy

This scholarship of \$250 is given annually by Gilman Brothers Inc. to help a student further his education in pharmacy.

**Rabbi Myer O. Grunberg Scholarship** All Colleges

Established in 1953 by Mrs. Myer O. and Miss Rose Grunberg, this annual award is available to a senior student in any college of the University. The award is made to that man or woman student who has evidenced in personal, business, and student relations those characteristics of leadership and human relations which make for a better social order. There is no restriction as to race, creed, color, or sex.

**Health Professions Scholarship Program**

Pharmacy

Under a grant from the Public Health Service, annual scholarships not in excess of \$2,500 may be awarded to students from low-income families who, without such financial assistance, could not pursue a course of study in the health professions. During the academic year 1967-68, awards may be made only to third- or fourth-year students in the College of Pharmacy. In succeeding years, the program will be available to middlers, juniors, and seniors.

**Vena Morse Lamson Scholarships**

All Colleges

These scholarships are provided through the income of a fund established in 1963 by Horatio W. Lamson in memory of his beloved wife. The scholarships are awarded annually to needy and worthy students who are enrolled in any of the Basic Colleges of the University. The scholarships are granted by the Committee on Financial Aid of the University without regard to national origin, sex, race, or creed.

**Avrom Aaron Leve Memorial Scholarship**

Psychology

This scholarship fund was established in 1957 in memory of Dr. Avrom Aaron Leve, former Assistant Professor of Psychology. The interest is used annually to provide scholarships for upper-class students majoring in psychology. The award is made on the basis of academic achievement, financial need, and character.

**George T. Marvin Scholarship Fund**

All Colleges

This fund was established in 1961 under the provisions of the will of George T. Marvin, a graduate of the Northeastern University School of Law, Class of 1918. Mr. Marvin designated that the income of this fund should be used to provide financial assistance to worthy and needy students to assist them in furthering their education at Northeastern University.

George T. Marvin Scholarships may be awarded to new students seeking admission to Northeastern and to students enrolled as freshmen and upper-classmen. Applicants must have satisfactory records of scholarship as of the time of making application and must demonstrate genuine need and good citizenship.

**Massachusetts State Pharmaceutical Association**

Pharmacy

This scholarship of \$200 established by the Massachusetts State Pharmaceutical Association, is awarded annually to a student who must be a resident of Massachusetts.

The Massachusetts State Pharmaceutical Association also awards a number of scholarships of \$100. Application for these scholarships may be secured from the office of the Association at 11 Beacon Street, Boston.

**McKesson & Robbins, Inc., Scholarship**

Pharmacy

This scholarship of \$200, given annually by McKesson & Robbins, Inc., is awarded to a worthy student in financial need.

**Frederick W. Muckenhoupt Scholarship**

All Colleges

This award was established in 1961 by Dr. and Mrs. Carl F. Muckenhoupt in memory of their son, Frederick W. Muckenhoupt, Class of 1959 of the College of Engineering.

The award is to be made annually to a student in good standing on the basis of need. Preference is given to a student enrolled in the Department of Electrical Engineering.

**The New England Paper Merchants, Inc., Scholarship** All Colleges

Established in 1959 by the New England Paper Merchants Association, Inc., this is an annual scholarship awarded to a junior or senior who has demonstrated by his cooperative work achievement and his extracurricular activities an interest and potential in the field of sales. The recipient shall also be a student who has financial need, a good academic record, and high character.

**Norfolk County Pharmaceutical Association Scholarship** Pharmacy

This scholarship of \$50 is awarded annually to a student who meets the requirements both financially and scholastically and is a resident of one of the member towns covered by the Norfolk County Pharmaceutical Association (Norwood, Dedham, Canton, Walpole, Millis, Needham, Westwood, and Islington).

**Physical Therapy Traineeships**

Boston-Bouvé

Undergraduate traineeships in physical therapy are made available to the University through the Department of Health, Education, and Welfare. Junior and senior physical therapy majors recommended by the faculty may receive substantial financial awards which can be applied toward their college expenses.

**The Mildred A. Reardon Scholarship Award**

All Colleges

Delta Pi Alpha Sorority sponsors an annual award of \$100 to a deserving under-class woman in the Basic Colleges. Selection is made by the Dean of Women on the basis of financial need and academic standing. The award is given in honor of an outstanding alumna of Northeastern and Delta Pi Alpha, whose academic excellence, strength of character, and qualities of leadership have typified the ideal for which the sorority strives.

**Frank B. Sanborn Scholarship Fund**

Engineering

The Frank B. Sanborn Scholarship Fund was established in 1958 to provide a scholarship or scholarships of not more than \$500 to worthy and needy students selected by the University, without restrictions as to race, creed, or geographic origin, but with preference being given to students majoring in electrical, mechanical, civil, or industrial engineering, in the order stated.

Each recipient must be willing to assume a moral obligation to reimburse the fund as he may be able, in order to make similar financial aid available for other students in later years. There shall be no interest charged and no time specified for reimbursement.

**Clinton H. Scovell Scholarships**

Boston-Bouvé

Scholarships are made available annually to women students in Boston-Bouvé College through a fund provided by the will of Clinton H. Scovell.

**William Lincoln Smith Scholarship Fund      Electrical Engineering**

The fund was established in 1947 by Farnham Wheeler Smith, Class of 1924, Benjamin Lincoln Smith, Class of 1923, Thomas Hollis, Jr., Class of 1941, and other members of the family in honor of Dr. William Lincoln Smith, who served long, faithfully, and with distinction as Chairman of the Department of Electrical Engineering at Northeastern University.

The income from the fund is used for an annual scholarship award to a student enrolled in the Department of Electrical Engineering who has demonstrated excellence in some aspect of electrical research, stands high in his courses, or otherwise exhibits promise of future competence in the field. The award shall preferably be granted to a student who needs financial assistance to continue his college work.

**South Middlesex Pharmaceutical Association      Pharmacy**

This tuition scholarship of \$100, established in 1960, is awarded annually to a pharmacy student enrolled in the third, fourth, or fifth year who is in good scholastic standing and in financial need, and living in the area covered by the South Middlesex Pharmaceutical Association (Arlington, Belmont, Lexington, and Watertown). The recipient will be selected by the Scholarship Committee.

**South Shore Pharmaceutical Association Scholarship      Pharmacy**

The Scholarship Committee of the Association will select a freshman student in June of each year living in the area covered by the South Shore Pharmaceutical Association (Quincy, Braintree, Weymouth, Hull, Randolph, Hingham, Holbrook, and Cohasset) who will be awarded a \$100 scholarship to be applied to the tuition of the first semester of the sophomore year.

**Springfield Druggists' Association Scholarship      Pharmacy**

A scholarship of \$100 is offered by the Springfield Druggists' Association. This is to be awarded to a sophomore or junior who maintains the highest average in the Department of Pharmacy, and who is worthy and in need of financial assistance. The Springfield Druggists' Association Scholarship Fund was established in 1956.

**Ruth Page Sweet Scholarship Fund      Boston-Bouvé**

This fund was established in 1959 by members of the Class of 1919 and alumnae of the Bouvé-Boston School in honor of their classmate, Miss Ruth Page Sweet, dean of the school from 1929 to 1946, administrative director from 1946 to 1948, and director from 1948 to 1960. The scholarship is presented to a junior or senior who has demonstrated by her academic record and extracurricular activities a high level of professional promise.

**A. Gilbert Tenney Scholarship Fund      Engineering**

This fund is in memory of A. Gilbert Tenney, who served as a captain in the Air Force during the Korean War and was killed while in active service.

The income from the fund will be awarded to a needy student or students in the field of electrical engineering, studying under the Cooperative Plan of Education.

**Charles Irwin Travelli Scholarships**

All Colleges

Numerous scholarships have been given yearly since 1950 to students demonstrating financial need, high academic achievement, and an active interest in University life as shown by participation in one or more major activities. Students are named as recipients of Travelli Scholarships at the completion of their sophomore year. Under normal circumstances these awards will continue through the senior year.

**Samuel Ulman Scholarship Fund**

All Colleges

This fund was established in 1960 by Mrs. Samuel Ulman in memory of Samuel Ulman, a student at Northeastern University from 1912 to 1915. The purpose of the fund is to provide scholarship assistance to students who have financial need and good scholastic standing.

**United States Rubber Company Foundation Scholarships**

Engineering, LA, BA

The United States Rubber Company Foundation has established scholarships to be awarded to students in the Colleges of Engineering, Business Administration, and Liberal Arts who qualify on the basis of leadership and character, academic performance and potential, need for financial assistance, and demonstration of interest in a career in industry.

Recipients assume a moral obligation to repay at least 25 per cent of any scholarship received to the University Scholarship Fund after graduation. Students must have completed at least two years of their undergraduate program to be eligible.

**University Scholarships**

All Colleges

Northeastern University has for many years maintained a scholarship fund for deserving, qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. The recipient of a Northeastern scholarship must be willing to assume a moral obligation to repay the University at some future date.

**Henry E. Warren Scholarships**

All Colleges

Established in 1958 by the Warren Benevolent Fund, Inc. The purpose of these scholarships is to encourage students to gain cooperative work experience reinforcing study in their major field.

Scholarship awards in the total amount of \$1,000 are awarded annually without restrictions as to race, creed, or national origin, to upper-class students in fields in which related cooperative work positions are few or poorly paid. The recipients of the scholarship must have demonstrated good scholastic standing, fine character, and financial need.

**The Jacob Wasserman Scholarship Fund**

Pharmacy

Established in 1966 by his friends in memory of Jacob Wasserman, this fund is to provide scholarship aid to a senior student in the College of Pharmacy. The award will be made annually on the basis of financial need, academic performance, and personal qualities.

**Western Electric Fund Scholarship Award**

Engineering

This scholarship, established in 1956, is awarded annually to an upper-class student in mechanical, electrical, or industrial engineering. The recipient must be an outstanding student who also has financial need. The Western Electric Company is the manufacturing company for the Bell Telephone System.

**AWARDS FOR UPPERCLASSMEN**

University awards are determined by scholastic and citizenship achievement. They are presented by appropriate committees headed by the Dean of Students and do not require a demonstration of financial need or formal application.

**The Academy Award**

Liberal Arts

The Academy, the honor society of the College of Liberal Arts, offers annually an award of \$100 to the sophomore in the College of Liberal Arts who, during the previous year as a freshman, made the highest scholastic record.

**William Jefferson Alcott, Jr., Award**

All Colleges

This award was established in 1934 by members of the faculty and other friends to perpetuate the memory of William Jefferson Alcott, Jr., a brilliant member of the Northeastern Department of Mathematics from 1924 until his death in 1933. The award to a senior is made annually from the income of the fund "for outstanding performance, either in the way of unusual excellence in routine work, or in connection with some intellectual activity outside or beyond the requirements of the curriculum."

**Alumni Awards for Professional Promise**

All Colleges

Established in 1947 by the Alumni Association, these awards are presented annually at a final senior class meeting in the spring of the year. The awards are made to the outstanding seniors in each of the seven Basic Colleges who have demonstrated unusual professional promise through their character traits, scholastic achievement, and cooperative work performance.

**The Beta Gamma Sigma Society Award**

Business Administration

The Massachusetts Delta Chapter of Beta Gamma Sigma, the national honorary society of colleges of business administration, offers an annual scholarship of \$100 to the sophomore in the College of Business Administration who, during the previous year as a freshman, made the highest scholastic record.

**Cooperative Education Awards**

All Colleges

These awards are presented to seniors in each of the Basic Colleges in recognition of outstanding performance in the Cooperative Education Program, through which they have personified the objectives and ideals of the University. The awards are presented at the Annual Awards Luncheon.

**Sears B. Condit Honor Awards**

All Colleges

These awards were established in 1940 through the generosity of Sears B. Condit. In the fall of the year at a University convocation, Sears B. Condit

Honor Awards, not less than 20 in number, are awarded annually to outstanding students in the senior class of the Colleges of Liberal Arts, Business Administration, Pharmacy, Education, Engineering, and Nursing, and Boston-Bouvé College. Each award carries a stipend of not less than \$100 as well as a certificate of achievement.

### **Alfred J. Ferretti Award**

Engineering

Tau Kappa Chapter of Pi Tau Sigma, the Mechanical Engineering National Honor Fraternity, sponsors an annual award to the sophomore mechanical engineering student at Northeastern having the highest scholastic standing. The award is named in honor of Professor Ferretti, who retired June 30, 1961, after 43 years of service to the University.

### **The Harold D. Hodgkinson Achievement Awards**

All Colleges

Established in 1954, the Harold D. Hodgkinson Achievement Awards of \$500 each are granted annually to a junior student in Division A and Division B for the senior year. The winners of the awards are known as the Hodgkinson Scholars for the year in which they are chosen.

The award is based primarily upon distinguished scholastic achievement with due consideration of character, personality, qualities of leadership, co-operative work experience, military record, if any, and service in voluntary organizations and activities. Student leadership accomplishments and professional potential are evaluated in connection with these criteria.

Other qualifications being equal, a relative of the donor or a candidate connected with Filene's by cooperative work or relationship is given preference. The Hodgkinson Scholar is chosen by a committee of administrative members of the faculty. An appropriate certificate is presented to each recipient as a permanent record of his selection.

### **Kappa Iota Epsilon Award**

Education

Kappa Iota Epsilon, the College of Education honor society, offers an annual award of \$100 to the education sophomore who, during the freshman year, achieved the highest scholastic record.

### **The Lilly Achievement Award**

Pharmacy

The Lilly Achievement Award is given to a graduating senior for superior scholastic and professional achievement. Leadership qualities, professional attitudes, and academic performance will be considered in the selection of the individual for this award.

### **Julia and Merrill Robert Lovinger Award**

All Colleges

This annual \$100 award was established in 1960 by William Lovinger for the purpose of giving assistance to a student who has financial need and acceptable scholastic standing.

### **Robert Lubets Award**

Business Administration

The award was established in 1953 by the Boston accounting firm of Robert Lubets & Company to recognize outstanding professional development and personal growth by students training for careers in accounting. One hundred

dollars will be awarded to that degree candidate who at the completion of his junior year has demonstrated the greatest personal growth and professional development as evidenced by his improvement in scholastic achievement accompanied by professional aptitude indicative of future success as an accountant.

**Harold A. Mock Award****Business Administration**

Established in 1959 by Harold A. Mock, a distinguished alumnus of the University, this annual award of \$200 is made to an outstanding member of the junior class in the College of Business Administration. The Committee on Scholarships selects the recipient on the basis of high academic standing and cooperative work, achievement, participation in University extracurricular activities, personality, and character.

**Ruth E. Phalen Memorial Award Fund****All Colleges**

This fund was established in 1959 by Thomas E. Phalen, Jr., a member of the faculty, in memory of his wife. The income from this fund is used yearly as a cash award to a senior, junior, or middler, preferably in the College of Engineering, who maintains at least a 2.0 academic average, shows outstanding ability in one or more varsity sports, and demonstrates excellent campus citizenship.

**Roland Guyer Porter Memorial Fund****Electrical Engineering**

This fund was established in 1953 by colleagues and friends of the late Professor Roland G. Porter, for many years head of the Department of Electrical Engineering. Interest from the fund provides an annual award to a student in the Department of Electrical Engineering who best exemplifies the qualities of mind and character which Professor Porter did so much to develop in his lifetime.

**President's Awards****All Colleges**

Since 1929, at the annual Dean's List Dinner in both divisions, four scholarships of \$100 each, known as the President's Awards, have been presented to the students with the outstanding records in the sophomore, middler, junior, and senior classes. The awards are accompanied by a congratulatory letter from the President.

**ROTC Awards****ROTC**

Awards totaling \$1,000 are available to ROTC cadets each year. The University offers nine \$50 awards annually. They are: one to the outstanding freshman cadet, four to sophomores (one in each division), two to middlers (one to each division), and two to juniors (one to each division).

Scabbard and Blade (the cadet officers' honorary society) offers four \$125 awards annually to middlers. The Pershing Rifles (the basic course honorary society) offers a \$50 award to a sophomore Pershing Rifles cadet.

Academic Achievement Awards are won by each cadet in the top 10 per cent of ROTC classes. This award, an embroidered wreath, is worn on the right sleeve of the uniform during the year immediately following. Leadership

Achievement Awards, consisting of letters of commendation, are awarded to each cadet in the top 10 per cent in leadership potential.

Many medals and trophies are also awarded by other organizations to ROTC cadets for achievements in diverse fields.

### Tau Beta Pi Award

Engineering

Massachusetts Epsilon Chapter of Tau Beta Pi Association, national honorary society in engineering, offers annually a scholarship of \$100 to the sophomore in the College of Engineering who, during the previous year as a freshman, made the highest scholastic record.

### Woman of the Year Award

All Colleges

The women's societies of the University sponsor an annual scholarship of \$100 to the senior woman student who, by high scholastic attainment and by demonstration of the quality of leadership, has proven herself the outstanding woman student of the year.

## LOAN PROGRAMS

### Health Professions Student Loan Program

Pharmacy

Under recent amendments of the Health Professions Educational Assistance Act of 1963, students enrolled in the middle, junior, and senior year in the College of Pharmacy are eligible to participate in this program. The conditions are similar to those of the National Defense Student Loan Program, with the maximum of \$2,500 available to the borrower in an academic year.

The loans shall bear interest at the rate of 3 per cent per annum or the "going Federal rate" at the time the loan was made — whichever is greater.

There are no cancellation provisions under this program for persons engaging in the practice of pharmacy.

### Guaranteed Loan Program

All Colleges

The major objective of this program is to make loan insurance available to any college student who wants to borrow.

Under this program a student may borrow from a bank or other financial institution. A graduate student may borrow as much as \$1,500 a year; an undergraduate, as much as \$1,000.

A student from a family with an adjusted income of less than \$15,000 a year pays no interest while he is in the University. Repayment of principal and interest begins when the student has ceased his course of study. At that time the Federal Government pays approximately one half the interest and the student the remainder. A student from a family with an adjusted income higher than \$15,000 a year pays the entire interest on the loan, but he may borrow under the Guaranteed Loan Program at 6 per cent simple interest.

Students may obtain additional information and the necessary application forms from their local bank or other financial institution.

### National Defense Student Loan Program

Any student in good standing who can demonstrate financial need is eligible to apply to the Director of Financial Aid for Students at Northeastern for assistance under the National Defense Student Loan Program. The law requires that each borrower be at least a half-time student, in need of the amount of the loan, and capable of maintaining a good standing in his chosen course of study.

An undergraduate student may borrow up to \$1,000 each academic year to a total of \$5,000. Graduate students may borrow as much as \$2,500 per year to a maximum of \$10,000. The repayment period and the interest do not begin until nine months after the student ends his studies. The loans bear interest at the rate of 3 per cent per year, and repayment of principal may be extended over a ten-year period.

If a borrower becomes a full-time teacher in an elementary or secondary school or in an institution of higher education, as much as half of the loan may be forgiven at the rate of 10 per cent for each year of teaching service. Borrowers who elect to teach in certain eligible schools located in areas of primarily low-income families may qualify for cancellation of their entire obligation at the rate of 15 per cent per year.

Northeastern approves and makes the loans and is responsible for collections. Repayment may be deferred up to a total of three years while a borrower is serving in the Armed Forces, with the Peace Corps, or as a Volunteer in Service to America (VISTA). Repayment is deferred for as long as a borrower is enrolled at an institution of higher education and is carrying at least a half-time academic work load.

### The New England Society Student Loaning Fund

All Colleges

The purpose of this revolving Student Loaning Fund, established by the New England Society, is to make available to deserving students, especially those of New England birth or ancestry, small amounts of money as temporary loans to meet emergencies.

It is not intended to be used for large loans to cover scholarships, board, or room rent, or for loans which will be outstanding more than three months.

### Nursing Student Loan Program

Nursing

Funds under this program are available to full-time nursing students enrolled in the associate program for the academic year 1967-68. The conditions are similar to those of the National Defense Student Loan Program, with a maximum of \$1,000 available to the borrower in an academic year.

The loans shall bear interest at the rate of 3 per cent per annum or the "going Federal rate" at the time the loan was made — whichever is greater.

The act provides that a portion of the loan and interest may be canceled in the event that the borrower is employed as a professional nurse at a public or non-profit private institution or agency (including teaching in any of the fields of nurse training or service as an administrator, supervisor, or consultant in

any of the fields of nursing). The cancellation for employment shall be at the rate of 10 per cent of the amount of the loan which was unpaid on the first day of such service for each complete year of employment, up to a maximum of 50 per cent of the total loan.

### **University Long-Term Loan Fund**

All Colleges

Northeastern maintains a loan fund for the purpose of aiding students in meeting their tuition expenses from quarter to quarter.

This fund is in many ways similar to the National Defense Loan Fund. Money borrowed need not be repaid until after graduation; and interest, at the rate of 3 per cent, does not become effective until one year after that time.

Students who qualify for this assistance may borrow as much as full tuition for any given quarter.

# *Student Activities*



Northeastern University regards student activities as an integral part of its educational program. The Student Activities Office is charged with the responsibility of co-ordinating the various types of activities and of administering the social, musical, literary, and athletic organizations in such a way as to enable each to contribute in a wholesome, worthwhile manner to student life at Northeastern. Every student is encouraged to participate in such activities as may appeal to him.

Members of the faculty also are interested in extracurricular activities. A faculty adviser is appointed for each student organization. His function is to encourage the students in the

development of their programs, and to give them the benefit of his experience and mature point of view in integrating these programs with other important phases of college life.

One of the outstanding contributions of the Cooperative Plan in the field of higher education has been its capacity to develop in students those powers of social understanding that are so essential to success in professional life. At Northeastern the program of student activities is made to contribute to this end in a very real way. It is a conscious aim of the student activities advisers to develop among their advisees those qualities of personality and character which will enhance their usefulness as future business or professional men and as citizens.

Students have splendid opportunities to develop administrative and executive ability as leaders of undergraduate organizations. No academic credit is awarded for any student activity. However, participation in student activities is often the determining factor in awarding prizes and scholarships, and in giving recommendations for graduate study and job placement. Approximately three-fourths of the undergraduate student body participates annually in one or more forms of student activity.

## Athletics

The University maintains both varsity and freshman teams in baseball, basketball, crosscountry, football, hockey, track, and crew. Games and meets are arranged with many eastern colleges. A well-rounded program of intramural sports is available for men students, and a program of intramural sports and dance is offered to women students.

Athletic policies for the University are determined by the Committee on Student Activities. This committee determines the eligibility of students to participate in athletics, approves the various sports schedules, and approves awards of letters and numerals to qualified athletes.

## Honor Societies

Twelve honorary societies are chartered in the Colleges:

**Phi Kappa Phi**—national interdisciplinary honor society

**Tau Beta Pi**—in the College of Engineering (Massachusetts Epsilon Chapter)

**Nu Chi Epsilon**—in the College of Engineering, Department of Chemical Engineering

**Eta Kappa Nu**—in the College of Engineering, Department of Electrical Engineering, Gamma Beta Chapter)

**Pi Tau Sigma**—in the College of Engineering, Department of Mechanical Engineering (Northeastern Tau Kappa Chapter)

**Phi Alpha Theta**—in the College of Liberal Arts, History Department (Northeastern Zeta Tau Chapter)

**Pi Sigma Alpha**—in the College of Liberal Arts, Political Science Department (Northeastern Delta Gamma Chapter)

**Alpha Pi Mu**—in the College of Engineering, Department of Industrial Engineering

**Chi Epsilon**—in the College of Engineering, Department of Civil Engineering

**Kappa Delta Pi**—in the College of Education

**Beta Gamma Sigma**—in the College of Business Administration (Massachusetts Delta Chapter)

**The Academy**—in the College of Liberal Arts

**Alpha Kappa Delta**—in the College of Liberal Arts, Sociology Department

**Rho Chi Society** (Beta Tau Chapter)—in the College of Pharmacy

Election to the college honorary societies is based primarily upon scholarship, but, before a man or woman is privileged to wear the honorary society insignia, there must be evidence of an integrity of character and an interest in the extracurricular life of the University. The societies have memberships consisting of the outstanding men and women in the Colleges. Election to an honorary society is the highest honor that can be conferred upon an undergraduate.

## Publications

**The NEWS**—A college newspaper, the **Northeastern NEWS**, is published each week throughout the college year by a staff selected from the student body. The copy is prepared, edited, and published by the students themselves with the counsel of a faculty adviser. Opportunity is afforded for the students to express their opinions on subjects relating to study, cooperative work, social events,

and topics of the day. Positions on the **NEWS** staff and promotions are attained by competitive work. The paper is in part supported by advertising, both national and local, and in part by a portion of the student activities fees. The **Northeastern NEWS** is a member of the Eastern Intercollegiate Newspaper Association and sends one of its editors to the annual convention of this association each year. Copies of the **NEWS** are mailed to upperclassmen when they are on co-operative work and to freshmen after the close of their college year.

**The SPECTRUM** — A literary magazine whose editors select for publication the best examples of creative writing submitted by the student body.

**The CAULDRON** — The combined senior class publishes annually a college yearbook, **The CAULDRON**. It is distributed without charge to the seniors and contains a complete review of the college year with class histories, pictures of all seniors, of the faculty, and of undergraduate groups, as well as a miscellany of snapshots and drawings contributed by students.

### **Student Council**

Student government of the Colleges at Northeastern University is vested in the Student Council, composed of elected representatives from the various classes. The Council is the authority on all matters relating to student policies not definitely connected with classroom procedure. It has jurisdiction, subject to faculty approval, over all such matters as customs, privileges, and campus regulations.

### **Student Union**

Northeastern's student service organization is the Student Union, located in Room 260 of the Carl S. Ell Student Center. The activities of the Union are threefold in character: First, the Union serves the students and the community through volunteer participation in recreational and service activities for settlement house children, hospital patients, and the aged and infirm in State institutions. Second, its members volunteer as student aides in many of the special projects conducted by and for the University. Third, the Union conducts a variety of social and educational activities for members.

The Chapel Committee assists the Dean of Chapel and Chapel Choir adviser in conducting the voluntary and interfaith services held on Wednesdays from 8:20 and 8:45 a.m. in the Bacon Memorial Chapel. This committee also has charge of special chapel programs at the Christmas and Easter seasons.

### **Clubs**

To assist in the promotion of social, cultural, and intellectual advancement through informal channels, the University sponsors more than 130 clubs. The following partial list is given to indicate the variety of opportunities available.

**Art Club** — This group is open to all Northeastern students interested in sketching or painting. Weekly meetings are organized to provide instruction and guidance in pencil and charcoal sketching, water coloring, and oil painting. The regular program includes several field trips for practice in sketching or painting seascapes and landscapes. Several exhibitions of the work of members are held during the year.

**Auto Club** — Members conduct special programs for sports car and antique auto enthusiasts.

**Biology Club** — The Biology Club (Nu-Beta) serves to stimulate interest in the biological sciences by presentations of motion picture films and lectures, and participation in field trips. Membership is open to all students.

**Debating Society** — The purpose of the Debating Society is "to foster and promote an interest and facility in formal argumentation; to develop an impartial, unbiased, and intellectual consideration of questions and issues of current interest; and to sponsor intercollegiate relationships and competition in the debating field." Membership is open to all students of the Colleges.

**Husky Key** — This is the all-University organization whose major role is to stimulate school spirit, and to assist at athletic events and other major University functions.

**Hus-Skiers and Outing Club** — The purpose of the Hus-Skiers and Outing Club is to conduct an integrated program of ski activity and week-end outings. A tournament and carnival are held near the close of the winter season, in which all members are eligible to take part. The Club holds charter membership in the New England Intercollegiate Ski Conference. Skiing is recognized as a minor sport.

**International Relations Club** — Founded for the purpose of studying and discussing those current national and international events and issues which vitally concern our American life and institutions, the Club maintains contacts with similar organizations in other colleges.

**Jazz Society** — This group is primarily interested in contemporary American music and sponsors festivals, small "live" concerts, speakers, and sessions for listening to recent recordings.

**Mathematics Club** — Members discuss topics of mathematical interest which are either outside or beyond the scope of the regular mathematics courses.

**Military Affiliated Radio System (MARS)** — A world-wide organization of amateur radio operators sponsored by the U.S. Army Signal Corps. It operates station AAIWAS at Northeastern University. Membership is open to all "ham" operators who have or desire to obtain amateur licenses. It co-operates with the Radio Club.

**Musical Clubs** — The Office of Student Activities sponsors musical clubs such as the following: concert orchestra, band, chorus, and dance orchestra, for which all students with musical ability are eligible. Membership in the various musical clubs is attained by competitive effort.

**Political Clubs** — These clubs provide students with opportunities to become better acquainted with current political issues and to hear outstanding speakers from the national and state political organizations.

**Psychology Society** — An organization in which interests in technical psychology are pursued. The membership is open principally to majors in the field of psychology, but this does not preclude from participation any student who has an active interest in the subject.

**Radio Club** — One of the most popular undergraduate activities is the Radio Club. Members are provided opportunity for code practice and are encouraged to obtain their amateur licenses. The Club owns and operates station W1KBN,

a short-wave transmitter, located in the Radio Laboratory in the penthouse of Hayden Hall. Meetings are held about once a month for the discussion of technical matters. Practicing radio engineers are frequently invited to address the club at evening meetings, when students in both divisions may attend.

**Rifle Club** — Recognized as a minor sport, the Club offers opportunities for intercollegiate competition on the varsity level, as well as intramural matches for various club teams. ROTC cadets participate in Army area matches and the women's rifle team in National Rifle Association competition.

**Silver Masque** — This club affords an opportunity for those students interested in dramatics to participate in several productions during the college year. Qualification for the cast and for positions on the business staff is through competition under the direction of the faculty adviser.

**Sociology Club** — This organization provides an opportunity for sociology majors, as well as interested students from other fields, to join with faculty members of the department to explore matters of common interest that pertain to the field.

**Symphony-in-Residence** — Membership in the Boston Civic Symphony, which rehearses and plays at Northeastern's Huntington Avenue Campus, is available for students who enjoy playing symphonic music. The Symphony is staffed primarily by non-professional musicians of the community, and it welcomes N.U. student participation. Auditions are arranged through the Music Department.

**Table Tennis Club** — Games are played weekly and tournaments held periodically.

**Underwater Society** — This group is concerned with marine exploration. It organizes scuba diving trips and conducts geologic and archaeological surveys.

**University Band** — Open to all students with musical ability, it performs at University events such as convocations, football, basketball, and hockey games, and at parades.

**Women's Societies** — The social activities for women are centered in two societies, Omega Sigma and Gamma Delta. Each society has its own program of banquets, teas, informal parties, general meetings, and social service projects. The societies co-sponsor a mid-winter dance and other similar activities. One of the primary objectives of the societies is to offer the women students at Northeastern University opportunity for closer friendship, for spirited participation in wholesome activity, and for leadership development.

**WNEU (Campus Radio)** — This organization operates the University's radio station WNEU, broadcasting news bulletins and music to certain student areas on the University campus and to Northeastern dormitories and fraternity houses.

**Yacht Club** — The Yacht Club is a member of the Intercollegiate Yacht Racing Association. The club participates in regattas held in the Charles River Basin and also at other colleges. Sailing is recognized as a minor sport.

### **Professional Organizations**

The purpose of student chapters of national professional societies is to provide an interchange of information on technical subjects, new developments, and professional standards. The chapters at Northeastern hold regular meet-

ings and social affairs, and send representatives and delegations to outside meetings.

The following professional societies are open to upperclassmen in the respective professional fields:

**Accounting Society** — All students interested in accounting are invited to become members of this club. Problems involving accounting are presented and discussed at club meetings. Upperclassmen present problems arising out of thesis or cooperative work experience, and able practitioners from the professional world are invited to present papers and lead the student discussions.

**Advertising Club** — Affiliated with the Junior Advertising Club of Boston and with the National Industrial Advertisers Association through the Technical Advertising Association of Boston. Members of this club are committed to the development of professional associations and interests.

**American Association for Health, Physical Education and Recreation** — North-eastern University students preparing for teaching or recreation leadership in schools and communities are eligible for membership in the State and National Associations. The goals of each professional student section are those of enrichment in the profession and its services, stimulated by regular meetings including seminars, guest lectures, conference participation, and associated projects.

**American Chemical Society** — Membership is open to upperclassmen majoring in chemistry or chemical engineering. Meetings are held twice during each quarter, at which times talks and motion pictures are given on various chemical subjects.

**American Finance Association** — The purpose of this society is to increase knowledge of the investment field by providing opportunities for discussions and by arranging for supplementary talks by outstanding personalities in the professional world of finance. All interested students are welcome at the meetings, which are held regularly during each quarter.

**American Institute of Physics** — Membership is open to all students having physics as one of their primary interests. Meetings are held regularly. The program consists of student and guest speakers, demonstrations, films, and tours through local centers of research.

**American Marketing Association** — Students in the College of Business Administration maintain this chapter for the purpose of enhancing the professional development of its members. Meetings are held each quarter, at which executives from Greater Boston firms discuss current issues in the field.

**American Pharmaceutical Association (Student Chapter)** — The College of Pharmacy sponsors a Student Chapter of the American Pharmaceutical Association. The Chapter is an active organization, founded to promote, in the broadest and most liberal manner, pharmacy as a science and as a profession, according to the objectives of the Constitution of the American Pharmaceutical Association, so that students may be better prepared to serve pharmacy in the future. Guest lecturers of national and state prominence address the Chapter during the year.

**American Physical Therapy Association** — Student membership is open to upperclassmen majoring in physical therapy. Monthly chapter meetings pro-

vide interesting and provocative programs and offer the student an opportunity for added dimensions in professional growth and development.

**Armed Forces Communications and Electronics Association (AFCEA)**—This is a national professional society composed of the leaders of industry and of the departments of the Armed Forces concerned with communications, electronics, and photography. It is sponsored by the Signal Corps branch of ROTC. Membership is open to any student who is interested in communications, electronics, and photography. They take many field trips and have prominent speakers at regular meetings.

**Engineering Societies, National**—Students in the several professional curricula of the College of Engineering operate Northeastern University sections of the appropriate national professional societies. Chief among these are the following:

American Society of Civil Engineers  
American Society of Mechanical Engineers  
American Institute of Chemical Engineers  
American Institute of Industrial Engineers  
Institute of Electrical and Electronic Engineers  
Society of Women Engineers

Members of the engineering faculty who hold membership in the parent organizations serve as advisers to these student groups. Meetings are held regularly, and practicing engineers are invited to address the sections. Occasionally appropriate motion pictures are shown, or the group visits some current engineering project in the vicinity of Boston. The College of Engineering encourages these student sections of the technical societies in the belief that they provide a wholesome medium for social intercourse as well as a worthwhile introduction to professional life.

**National Education Association**—A professional association for college students actively preparing to teach. Its aim is to provide experiences which help develop professional awareness and competency and assist in guiding students into proper areas of specialization.

**Society for the Advancement of Management**—The purposes of this professional society are to stimulate student interest in the profession of management and to present to the student a picture of management problems and functions through lectures, plant visitations, group discussions, and the like. Membership is open to all upperclassmen interested in the profession of management. The N.U. Student Chapter is sponsored by the Boston Chapter of S.A.M.

**Society of American Military Engineers (SAME)**—This is a national professional society composed of civilian industrial leaders and officers of the Armed Forces concerned with military and industrial construction and military engineering. Membership is open to all engineering students. It is sponsored by the Corps of Engineers branch of ROTC. They take many field trips and have prominent speakers at regular meetings.

## Professional Pharmacy Organizations

**Alpha Zeta Omega**—A national pharmaceutical fraternity, installed Upsilon Chapter in 1951.

**Delta Sigma Theta**—An international fraternity of the healing arts, embracing members in Medicine, Dentistry and Pharmacy. The local chapter was installed in 1953.

**Rho Pi Phi**—An international pharmaceutical fraternity, installed Tau Chapter in 1957.

**Kappa Psi**—A national pharmaceutical fraternity, installed Gamma Lambda Chapter in 1958.

**Lambda Kappa Sigma**—A national professional sorority for women in pharmacy. Alpha Rho Chapter installed in 1963.

## ROTC Honorary Societies

**Pershing Rifles**—This is an honorary society open to ROTC freshman and sophomore cadets who distinguish themselves. The national society was founded in 1894 at the University of Nebraska and now has about 130 chapters at colleges and universities throughout the country. Company A, 12th Regiment, at Northeastern University was chartered in 1952. It encourages, promotes, and develops citizenship and the highest ideals of the military profession. The Rifles have a crack drill team that participates at University and local civil ceremonies.

**National ROTC Band Association**—This is an honorary society open to members of the ROTC Band. It provides recognition for the contributions of ROTC bandsmen to the Cadet Brigade. The Association encourages the development of leadership and character while promoting the highest standard of musicianship. The Band Association sponsors the participation of the ROTC bandsmen in community and civic functions.

**Scabbard and Blade**—This is the ROTC cadet officers' honorary society. The National Society was founded in 1905 at the University of Wisconsin, and there now are over 128 chapters at colleges and universities throughout the United States. Company H, 11th Regiment, at Northeastern was chartered in 1954. Membership is restricted to advanced course cadets and is by invitation only. Scabbard and Blade is a most important ROTC student activity. It sponsors the Annual Military Ball.

## Class Organization and Activity

Each of the classes in the Basic Colleges elects its officers and carries on activities as a class. Dances are sponsored by the classes at regular periods throughout the year. One of the highlights of the social program is the Junior Promenade, held each spring at one of the Boston hotels.

Senior Week is the culmination of five years of class activities. Informal dances, beach outings, a moonlight cruise, and the formal Senior Promenade are held during the week prior to Commencement.

## **Convocations**

These meetings are usually held in Symphony Hall. There is a President's Convocation for Freshmen during the Orientation Period. Meetings for the entire University, known as the Fall Convocation and the Honors Convocation, are held periodically, and bring before the student body some of the ablest and foremost leaders of our country. Attendance is compulsory. Other convocations may be announced during the year. These meetings are under the direction of the Dean of Students' Office.

## **Nonsectarian Chapel Services**

Nonsectarian chapel services are held from 8:20 to 8:45 a.m. on Wednesdays throughout the year. Northeastern was founded upon inclusive and broad religious principles, and spiritual values are regarded as indispensable to good citizenship. Attendance at chapel services is therefore encouraged though not required.

The Bacon Memorial Chapel is located in the Ell Student Center. Adjoining it the Dean of Chapel has his office, where he is available to all students upon appointment.

For over three decades eminent leaders of religion—ministers, priests, and rabbis alike—have participated in this interfaith service. A chapel choir is led by the director of music, and students of various religious backgrounds assist in the order of worship.

The Northeastern chapel program enjoys the distinction of having recognition through charter membership in the National Association of College and University Chaplains.

## **Social Fraternities**

Thirteen Greek letter fraternities are currently chartered by Northeastern University. Each fraternity is provided with a faculty adviser who is responsible for the proper administration of the fraternity house under the rules and regulations established by the faculty. The fraternities in the order of their establishment are as follows:

Beta Gamma Epsilon	Phi Beta Alpha	Phi Alpha Rho
Alpha Kappa Sigma	Phi Gamma Pi	Zeta Gamma Tau
Nu Epsilon Zeta	Phi Sigma Kappa	Theta Rho Epsilon
Alpha Epsilon Pi	Tau Epsilon Phi	Sigma Phi Beta
	Gamma Phi Kappa	

Elected representatives from each fraternity make up an Interfraternity Council, a body which has preliminary jurisdiction over fraternity regulations. Its rulings are subject to the approval of the Committee on Student Activities.

## **Women's Organizations**

In addition to Omega Sigma and Gamma Delta, the women's societies, women's special interest groups include the Girls' Sports Association, the

Modern Dance Group, Lambda Kappa Sigma (Pharmacy sorority), and the Northeastern chapter of the Society of Women Engineers.

Four local sororities are chartered by the University. Each has a faculty adviser. An Intersorority Council, made up of representatives from the four organizations, coordinates their activities and regulations. The four sororities are as follows:

Chi Pi Epsilon	Founded 1961
Delta Pi Alpha	Founded 1961
Theta Sigma Tau	Founded 1962
Kappa Theta Xi	Founded 1962

### **Religious Organizations**

In 1961 the University voted to permit student religious organizations to be formed and officially recognized. To date, seven such groups have petitioned for and received recognition.

The Christian Science Organization	The Newman Club
Canterbury Club	Hillel Counselorship
Baptist Fellowship	Lutheran Club
Intervarsity Christian Fellowship	



Division A of the Northeastern ROTC Cadet Brigade, one of the largest ROTC units in the United States, shown in formation on the campus quadrangle.

## *Reserve Officers' Training Corps*

### **General Objectives**

The Department of Military Science is the instructional department of the University which administers the Army Reserve Officers' Training Corps (ROTC) Program. The Reserve Officers' Training Corps is regarded by Northeastern University as an integral part of its educational program, and is made available on a voluntary basis to all male undergraduate students of the Colleges who are otherwise qualified. The University encourages enrollment in the belief that the leadership, citizenship, and military training available to students taking ROTC is beneficial in their over-all development as future leaders. The courses outlined in this section, accordingly, are available to students in the Basic Colleges of the University.

The Reserve Officers' Training Corps of the United States Army exists for the purpose of developing officers—leaders of men. It offers courses of instruction leading to a commission as a second lieutenant in the United States Army Reserve or the Regular Army. The mission of ROTC is to have ready in time of national emergency a corps of educated, trained military leaders for our nation. Our Northeastern ROTC is an Army, Senior Division, Class CC (Civilian College) unit.

The greatest benefit to the individual from ROTC training is its development of leadership qualities. Leadership—the ability to organize and direct the activities of others—is in high demand by business, industry, the social fields, the military service—almost all human enterprises.

The staff and faculty of the Department of Military Science consist of Department of the Army assigned officers, noncommissioned officers, and civilians assigned by the University. All military members are especially selected because of professional competence, educational background, and ability to fit into the University Family. Officers are individually nominated for assignment to the University and are assigned only after records have been reviewed and each individual has been accepted by the University.

Although the Department of Military Science is an instructional department of the Colleges, it is also interested in many extracurricular student activities as part of its over-all leadership development program. There exists, therefore, close association with the Department of Student Activities. Activities associated with ROTC (listed under "Professional Organizations" and "Clubs") have Army officers assigned by the University as Faculty Advisers.

Among the ROTC activities, the Annual Military Ball is one of the most colorful campus events of the year. Two additional colorful events also are open to the entire "University Family": the Spring Awards Ceremony honoring the University President, at which he presents ROTC scholarships; and the Summer Awards Ceremony. At these ceremonies University officials and distinguished guests recognize outstanding cadets with appropriate awards.

### Courses of Study

The program of instruction consists of a Basic Course and the Advanced Course. The Basic Course (MS I and MS II), taken during the freshman and sophomore years, includes instruction common to all branches of the Army. Students completing the Basic Course may be awarded a "Military Training Certificate" as evidence of successful completion of this course. The Advanced Course (MS III and MS IV) is presented during the middle, junior, and senior years. Graduates of the Advanced Course receive commissions as second lieutenants in the U.S. Army Reserve or Regular Army.

### Enrollment in the ROTC Basic Course

Enrollment in the ROTC Basic Course is voluntary and is open to all male undergraduate students of the Basic Colleges who are physically qualified. The Basic Course may be entered only at the beginning of the freshman year except for veterans and certain students who have had Junior ROTC, for whom a portion of the Basic Course may be waived.

### **Eligibility for the Advanced Course**

The ROTC Advanced Course is available to male undergraduate students of the Basic Colleges who complete the Basic Course, to honorably discharged veterans whose service may be substituted for the Basic Course, or to students who complete a summer camp of 6 weeks following their sophomore year (since the Cooperative Program precludes regularly enrolled students' attending this camp, this method of qualifying for the ROTC Advanced Course will in most cases apply only to transfer students) if:

- (1) they are citizens of the United States and will not have reached 28 years of age at the time of commissioning;
- (2) they successfully complete such survey and general screening tests as may be prescribed;
- (3) they have three academic years to complete for graduation (two for full-time students);
- (4) they are selected by the Professor of Military Science and the University;
- (5) they execute a written contract with the Government; and
- (6) they successfully complete a U.S. Army physical examination.

### **Eligibility for ROTC Flight Training**

Northeastern University was among the original group of universities and colleges in the United States at which the Army ROTC Flight Training Program was introduced in 1956. This training is available during the senior year to specially selected cadets who successfully complete U.S. Army Aviation aptitude and physical tests. Flying instruction is conducted on an extracurricular basis by a civilian flying school under contract to the University and the U.S. Army. An Army faculty member supervises the program. Cadets successfully completing the course receive a Federal Aviation Agency Private Pilot's Certificate.

### **Veterans**

Honorably discharged veterans (enlisted) may be enrolled in ROTC with one or both years of the Basic Course waived, depending on prior service. They must be co-aligned in ROTC with other members of their class in the University curricula. Veterans are a distinct benefit to the Corps of Cadets because their actual experiences lend color to the program and help to orient cadets without service. They are especially desired and are normally appointed cadet officers upon enrollment. Certain credits are available to veterans depending upon service. Former commissioned officer veterans are not eligible for ROTC.

### **Transfer Students**

A student transferring to Northeastern University from another institution where he has been enrolled in an ROTC program similar to that at Northeastern is allowed credit for his work. The student's records are obtained from his former professor of military science. Such a transfer student must be co-aligned in ROTC with other students in his class.

Students transferring to Northeastern University as middlers, without previ-

ous ROTC training, may enroll in the Advanced Course providing they attend a six-week summer camp prior to the start of the middler year.

Students transferring to Northeastern University as sophomores may also enroll in ROTC as middlers providing they satisfactorily complete a six-week summer camp prior to the start of the middler year.

Transfer students may obtain complete information and assistance from the Department of Military Science.

## **Uniforms and Equipment**

An Army uniform is issued without cost to ROTC students in the Basic Course. Advanced Course students are individually fitted with a uniform, which becomes their personal property upon commissioning, and they continue to wear it as an officer after graduation. The Government furnishes \$100 toward this uniform, and the students pays a small additional charge. All other equipment, textbooks, etc., required for instruction are provided without charge throughout the five-year program. These items remain the property of the Government, and the students must safeguard them and use them in accordance with University and ROTC regulations. A \$10 deposit is required temporarily from all Basic Course students enrolling in ROTC until uniforms and property are returned in good condition. Any loss or damage to ROTC uniforms and equipment, exceeding the deposit, will be charged to the student.

## **Academic Credit**

A total of 20 quarter hours of academic credit is given for ROTC. The Basic Course may be substituted for physical education as a prerequisite for graduation. Fifteen quarter hours of credit are granted for the Advanced Course, and certain of these may be substituted in some of the Basic Colleges for upper-class academic work, as approved by the Dean, up to a maximum of 10 quarter hours. Thus, time spent in the Advanced Course is not always over and above the regular curriculum.

## **Pay and Scholarships**

ROTC benefits are both tangible and intangible. All Advanced Course cadets are paid \$50 monthly during actual Advanced Course instruction, a total of \$1,000 during the three years. Camp pay is \$151.95 monthly, over and above housing, messing, and medical care, which are free at camp. This is an important supplement to cooperative work income in offsetting tuition costs. Transportation to and from camp is paid at the rate of \$.06 per mile. Cadets also may compete for ROTC scholarships.

The Army offers full-tuition five-year scholarships to freshmen entering Northeastern University and enrolling in ROTC. Information concerning these scholarships is available to high school seniors by writing to:

Commanding General  
First U. S. Army  
ATTN: AHAAG-CA  
Fort Meade, Md. 20755

Application for these scholarships must be submitted early in January of the senior year in high school. In addition to the five-year scholarships, three-year scholarships for cadets entering the Advanced Course are available. These scholarships are awarded at the completion of the sophomore year. All Department of the Army scholarships pay full tuition, books, fees, and an allowance of \$50 a month.

All cadets may also qualify for scholarships of lesser amounts awarded by the University and several cadet societies.

### Draft Deferments

Public Law 51 (Universal Military Training and Selective Service Act of 1951 as amended by the Reserve Forces Act of 1955) permits students enrolled in ROTC, who are expected to attain appointments as commissioned officers in the Army Reserve, to be deferred from service for as long as they remain in good standing. ROTC deferment remains in effect until graduation or withdrawal from the University. An ROTC deferment is a matter of law and is not dependent upon conditions pertaining to any one Selective Service Board at any one time.

### Distinguished Military Students

There are military honors for ROTC graduates similar to academic honors for regular graduates. Honor graduates of ROTC are called Distinguished Military Graduates. If they are physically qualified and apply for it, they may be commissioned in the Regular Army instead of the Army Reserve, and enter into a Regular Army career on the same basis as graduates of the United States Military Academy at West Point. This is a splendid opportunity for those who are interested in the many advantages of a Regular Army career.

Cadets are eligible for designation as Distinguished Military Students in their junior year if they possess outstanding qualities of leadership, high moral character, and definite aptitude for the military service; have attained an academic standing in the upper half of their college class and in the upper third of their ROTC class; and further, have demonstrated leadership ability through participation in recognized campus activities.

### The Army as a Career

By following any curriculum leading to a degree, and by completing the ROTC Program, a student may qualify for a full-time career in the Regular Army. Cadets who have been designated Distinguished Military Students may apply for an appointment in the Regular Army. Notification of selection is made by mid-December of their senior year. They then become Regular Army officers with all conditions and opportunities for graduate education, on the same basis as graduates of the U. S. Military Academy at West Point.

An Army career as a Reserve Officer on extended active duty also is possible. Many graduates do not request a Regular Army appointment originally, but find the Army enjoyable and satisfying while serving their obligated tours of active duty. Those officers who request continuation and are accepted, serve in the Active Army as Reserve Officers, with the same pay, responsibilities, retirement benefits, and opportunities for promotion as Regular Army officers.

Most ROTC graduates pursue civilian careers and serve only limited tours of active duty. However, they may also benefit from their part-time Army careers by participating in the Reserve Unit training activities during evenings and at summer camp. They receive pay and accrue credit towards retirement at age 60 (after 20 years' service). Such part-time careers may result in eligibility for retired pay each month for the rest of their lives. This is a real financial security benefit, which is equivalent to a sizable annuity and is worthwhile for any person to seek.

**BASIC ROTC****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.101	Mil. Sci. I Org. Army & ROTC U.S. Army & Nat'l Sec. Leadership	3 1	91.102	Mil. Sci. I Weap. & Marksman- ship Map & Aerial Photos	3 1	91.103	Mil. Sci. I Leadership Lab. C.B.R.	(2) 1

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.104	Mil. Sci. II Mil. History Counterin- surgency	3 1	91.105	Mil. Sci. II Leadership Lab. Tactics	(2) 1

**ADVANCED ROTC****THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.106	Mil. Sci. II Small Unit Tactics	3 2.5	91.107	Mil. Sci. III Branches of Army Leadership Lab.	(2) 2.5

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.108	Mil. Sci. III Method of Instr. Operations	3 2.5	91.109	Mil. Sci. IV Communi- cations Counterin- surgency Leadership Lab.	1 (2) 2.5

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
91.110	Mil. Sci. IV Logistics Army Admin. Role U.S. in World Affairs	3 2.5	91.111	Mil. Sci. IV Mil. Law Serv. Orient. Map Reading Leadership	2 (1) 2.5

# **General Information**

## **Policy on Changes of Program**

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time pursuant to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

## **Textbooks and Supplies**

The Northeastern University Bookstore, located on the ground floor of the Ell Student Center, is a department of the University and is operated for the convenience of the student body. All books and supplies which are required by the students for their work in the University may be purchased at the Bookstore.

## **Physical Education Requirements**

The basic physical education requirement includes successful completion of two one-credit courses in physical education. Each course carries one quarter hour of degree credit.

Exemption from this basic requirement is granted when:

1. The University physician advises it.
2. A student has completed the two-year course in ROTC or prior active military service.
3. Transfer credit has been approved by the Dean of the College.
4. A student has been a member of an intercollegiate sports squad for two full seasons (men).

## **Part-Time Work**

Students who find it necessary to accept part-time jobs while attending college may obtain such work through the Office of Financial Aid.

Students are not justified in assuming that the University will take care of their expenses or guarantee to supply them with work sufficient to meet all their needs.

A student should have funds adequate to meet the expenses of the freshman year. They should amount to at least the first year's tuition plus books and supplies, and room and board for 36 weeks.

## GRADES AND EXAMINATIONS

### **Examinations**

Examinations covering the work of the quarter are usually held at the close of each quarter. Exceptions may be made in certain courses where, in the opinion of the instructor, and with the approval of the Dean of the College concerned, final examinations are not necessary.

### **Condition Examinations**

Condition examinations are usually given once each year for each division. The charge is \$3 for each condition examination.

The responsibility for the removal of a condition rests with the student, who is required to ascertain when and how the condition can be removed.

A student may take only one condition examination to remove a failure in a given course.

### **Special Final Examinations**

Students who have received permission to make up missed final examinations will be charged a single fee of \$5 covering all of the examinations missed within any one final examination period during a given period of illness.

### **Senior Condition Examinations**

No condition examinations in last-term senior courses are offered at the end of the last quarter. This means that a failure in a last-quarter senior course cannot be made up before Commencement.

### **Grades**

A student's grade is officially recorded by letter. Following is a listing of grades with their numerical equivalents:

	Numerical Equivalents
A Outstanding Attainment	4.0
B Good Attainment	3.0
C Satisfactory Attainment	2.0
D Poor Attainment	1.0
F Failure	0.0
I Incomplete	
WF Withdrew from Course — Failing	

A general average of D is not acceptable and will not allow a student to continue at Northeastern University.

Freshman students who are taking a full academic program and who have a weighted average for the year below 1.4 will not be permitted to register for advanced work. Upper-class students should consult the Student Handbook to ascertain the level of continuing achievement required of them by the faculty of their college.

An I, or Incomplete, grade is used for a temporary grade to show that the student has not taken the final examination in the course.

## **Dean's List**

A Dean's List, issued at the end of each quarter, contains the names of upper-class students who have a 3.0 weighted average in all subjects with no grade below C during the preceding period. Freshmen who meet the same standards in their work are included on a Freshman Honor List. No student subject to disciplinary action is eligible for either list.

## **Reports on Scholastic Standing**

Reports for all students are issued at the end of each grading period. Questions relative to grades are to be discussed with the student's faculty adviser.

Students are constantly encouraged to maintain an acceptable quality of college work. Parents and students are always welcomed by the college officers and faculty advisers for conference upon such matters.

Parents or guardians will be notified whenever students are advised or required to withdraw from the University. If parents so request, report cards will be sent to them instead of to the student.

## **Selective Service Deferment**

Students who wish to be deferred by Selective Service must make such requests personally to their local boards once a year. The University will furnish local boards with information including class standing *only at the written request* of the student. All students receive the forms necessary for deferment with their fall registration material. Because of the Cooperative Plan, the academic year at Northeastern is September of one year to September of the next.

## **GENERAL CONDUCT**

It is assumed that students come to the University for a serious purpose and that they will cheerfully conform to such regulations as may from time to time be made. Students are expected to observe the accepted rules of decorum, to obey the regulations of the University, and to pay due respect to its officers. Conduct inconsistent with the general good order of the University may result in disciplinary action. Damage to any building or to any of the furniture, apparatus, or other property of the University, will be charged to the student or students known to be immediately involved.

It is desired to administer the discipline of the University so as to maintain a high standard of integrity and a scrupulous regard for truth. The attempt of any student to present any work which is not his or her own, or to pass any examination by improper means, is regarded as a most serious offense and renders the offender liable to disciplinary action. The aiding and abetting of a student in any dishonesty is also held to be a grave breach of discipline.

## **Attendance**

Students are expected to attend all scheduled meetings of their classes.

Absence from regularly scheduled classes in any subject may seriously affect the standing of the student. It may cause the removal of the subject or subjects from the student's schedule.

Laboratory work can be made up only when it is possible to do so during hours of regularly scheduled instruction.

Attendance at all convocations of the student body is compulsory. Exceptions to this rule are made only when the student has received permission from the Director of Student Activities previous to the meeting in question.

### **Attendance at Commencement**

All candidates for a first degree (bachelor or associate) are required to attend Commencement in the year of qualification. First degrees in absentia are awarded only to candidates excused for personal or immediate-family illness, military service, or employment obligations beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean of the College in which the candidate qualifies. Each petition will be acted upon by the academic Dean involved, the candidate having the privilege of appeal to the Vice President for Academic Affairs.

## **INFORMATION FOR FRESHMEN**

### **Orientation Period**

In order that freshmen may be ready to pursue their academic work with greater composure and be somewhat acclimated before the beginning of scholastic work, three or four days prior to the first quarter are devoted to a freshman orientation period. All freshmen are required to attend all exercises at the University scheduled during the orientation period.

### **Orientation Class**

All freshmen attend an orientation class once each week for the first 13 weeks. This class is designed to instruct the student in the traditions, activities, and procedures of the University. Time is devoted to the proper methods of study for success in college and stress is placed on attitudes for success in later life. About a third of the classes are devoted to techniques and procedures of work under the Cooperative Plan.

### **Physical Examination**

All freshmen must submit a medical report showing evidence of a recent X-ray and physical examination prior to registration. All students failing to submit such a report on the approved form will be assessed a \$10 fee and given a special physical examination at the University during the orientation period.

### **Counselors**

At the time of matriculation each freshman is assigned to a personal adviser, a member of the faculty, who serves as an interested and friendly counselor during the perplexing period of transition from school to college. The aim of the freshman advisory system is primarily to guide students through their

first year. General counseling is under the direction of the Dean of Freshmen. Direct counseling of women students is supervised by the Dean of Women.

### **Individual Attention**

Attention is given not only to the scholastic problems of the student, but also to personal problems in which advice is needed and desired. The aim is to help the student to the fullest possible personal development.

The college records of all students are periodically analyzed in the light of their previous school records, their scores on psychological tests, and all other factors in their situations. If analysis suggests that they are not doing their best work, investigations are made to determine the impediment and eliminate its causes.

### **Counseling and Testing Center**

The University through its Counseling and Testing Center is prepared to assist students with their educational and vocational planning and with personal problems. The student is encouraged to explore his situation fully in the counseling sessions. Psychological tests may be taken to increase the student's knowledge of himself. An extensive file of information about careers and schools is maintained. The services of the Center are available without charge to all students in the Basic Colleges.

Vocational counseling services are also available on a fee basis to high school students and to adults.

The counseling services of the Counseling and Testing Center are approved by the American Board of Counseling Services.

### **Career Information Center**

The Career Information Center has the responsibility of preparing career materials for use in high schools and junior high schools. The Center maintains a library of career filmstrips and career tape recordings which are available to Northeastern students who may have a particular interest in the titles prepared by the Center. Arrangements for viewing filmstrips or listening to tapes may easily be made by visiting the Center in 155R.

## **STUDENT HOUSING**

The University maintains dormitory facilities for both men and women students. These are located near the Huntington Avenue campus and accommodate a large portion of the men students who live away from home. The residences for women students are sufficient to provide for all girls who need such accommodations while they are at the University.

### **Women's Residences**

Women's residences, under the supervision of Resident Directors, are maintained by the University. Board (including three meals a day) and room is \$396 per 12-week quarter.

Unmarried women students who do not live with their parents or a legal guardian while attending college are required to live in the University residences unless written approval of other arrangements has been obtained in advance from the Dean of Women. Permission to live in apartments or unsupervised rooming houses will normally be granted only to students who have reached their twenty-first birthday.

During cooperative work periods students who cannot live at home or in the University residences make special living plans through the Department of Cooperative Education. If the situation requires that the student live in an unsupervised residence, written approval from parents or guardian must be on file with that department.

Information regarding the women's residences may be obtained from the Director of University Housing.

### **Freshman Men's Residences**

The University provides living accommodations in its dormitories for all freshmen under the age of 21 living away from home. The cost is \$396 for each 12-week quarter, payable at the beginning of the term, and includes three meals each day. Applications for housing may be filed with the Department of Admissions after a student has been accepted. A dormitory deposit of \$100 must accompany the application for housing. The student's receipt of this \$100 deposit from the University is his guarantee of a room in the dormitory. (This deposit is non-refundable and will be applied against the first term's board-and-room charges.) Definite notice of room reservations will be sent by the Director of University Housing in the late summer.

Students should write to the Dean of Admissions for further information and for the Application for Residence.

### **Apartments for Upperclassmen**

The University maintains a 100-apartment housing unit which accommodates 280 men. Two-, three-, and four-man apartments are available which vary in size from two to four rooms plus bath. Apartments are fully furnished with beds, chairs, desks, stoves, refrigerators, desk lamps, kitchen table, and rugs. The cost is \$13 per week per student, payable on a quarter basis. The cost includes all utilities and bed linen, which is laundered weekly by the University.

Requests for such accommodations may be made by writing the Director of University Housing. Students are expected to make such arrangements on a quarter-to-quarter basis but may live in the apartments both while on cooperative work assignments and in school if they wish. All reservations are made on a first come, first served basis.

### **Fraternity Housing**

Certain fraternities provide opportunities for room and board for men at reasonable rates. Information regarding these housing facilities may be obtained from the Office of University Housing.

## Regulations Concerning Off-Campus Housing

Upperclassmen who cannot be accommodated in University residences should contact the Director of University Housing, who will offer assistance in procuring off-campus housing. The following rules and regulations apply:

1. Although the University does not encourage students to rent apartments away from the University, it is recognized that this living arrangement is acceptable to some parents. Approval for such housing will be made only under the following conditions:
  - a) The student renting an apartment **may not** be a freshman.
  - b) Upperclassmen under 21 years of age must see the Dean of Men **before** making apartment arrangements. An apartment request form must be completed by the student, and written approval of the parents is necessary before the request will be acted upon by the Dean.
  - c) Upperclassmen over 21 years of age must fill out and file with the Dean of Men an apartment request form. This is important as the University should know the address of all students not living at home.
2. The Registrar must be notified of the local address of all students.

All questions regarding the availability of housing, or the rules and regulations, should be directed to the Director of University Housing.

# *Alumni Association*

The 38,000 alumni of Northeastern are united under an all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 20 of the Forsyth Annex.

The official publication of the Alumni Association, **The Northeastern University ALUMNUS**, is published quarterly and sent free of charge to all alumni on record.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise awards to outstanding seniors in each of the eight Basic Colleges, are directed by the Association's Vice President for Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for co-ordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 50 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The Alumni Clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city. A Route 128 Luncheon Club is being organized and conducts meetings in the Waltham area.

The Association also sponsors and assists the Alumnae Association, Varsity Club, Law, Pharmacy, and Boston-Bouvé Alumni Associations, all of which have their own officers and conduct various programs throughout the year. In co-operation with the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

The Alumni Association is providing a unique and valuable service both to the University and to the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These well-attended meetings, conducted in co-operation with the Department of Admissions of the University, have been held in Burlington, Braintree, and Wellesley, Massachusetts. Recently this program was extended to Connecticut, Maine, New York, and Vermont, in areas where a Regional Club exists. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of our colleges and universities.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.





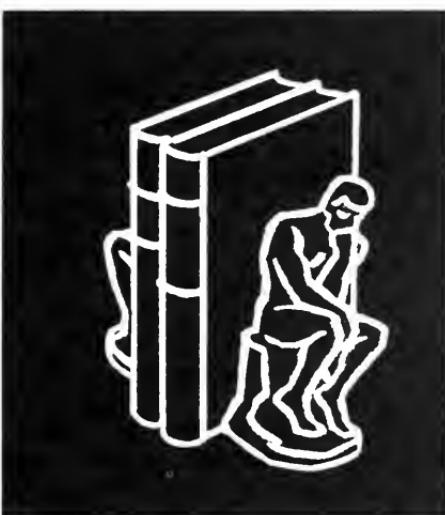
## *College of Education*

**Dr. Frank E. Marsh, Jr., Dean**

**Thomas J. Cavanagh, Assistant Dean**

**Dr. Ray C. Dethy, Assistant Dean and  
Director of The Graduate School  
of Education**

**Charles F. Haley,  
Associate Director of  
The Graduate School  
of Education**



## General Objectives

The College of Education is increasingly and continuously concerned with the quality of those who teach. In the paragraphs that follow, quality is generally described, and the several ways of assessing it are outlined.

### **Objective 1: Every teacher should learn the value of work.**

All students will be expected to take the five-year co-operative program because the staff of the College of Education believes in a regularly patterned program of work experience. Such opportunities are provided in social agencies, libraries, hospitals, and in schools.

### **Objective 2: Every teacher should be broadly educated and should be an excellent example of American culture.**

All students are expected to develop breadth in their program in two ways. First, students will be required to complete certain common course work, Social Science, United States History, American Literature, Public Speaking, Human Development, and English. Second, all students must complete a minimum of 16 credits in two areas of knowledge not related to their major field of concentration.

### **Objective 3: Every teacher should achieve an expertness in some field of knowledge.**

Those preparing to teach at the secondary level must choose an academic major from among the following fields: Social Studies, English, Foreign Languages, General Science, Biology, Chemistry, Physics, Mathematics. Those preparing to teach at the elementary level must select an area major from among the following: Social Sciences, Humanities, Science and Mathematics, or Language-Reading. It is recommended that students have a field of concentration in mind before admission to the University since in most cases the choice will make a difference in their program for the freshman year.

### **Objective 4: Each teacher should be professionally prepared for the position of his choice.**

In addition to their general education and specialized concentration, all students will share some common professional course work with related out-of-class experience and, in addition, will take course work appropriate to their level or field of teaching. Student teaching during the senior year will serve as an opportunity to apply what has been learned in the previous four years.

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Students admitted as freshmen are enrolled in the Lower Division of the teacher education program. Thus they will have about two years to estimate their abilities to master college work, to discover the wisdom of their choice of a major field, and to evaluate the strength of their commitment to, and qualifications for, teaching.

Those desiring certification will make application to the Upper Division, preferably early in their second year, and will be expected to submit to a

battery of tests and present such other evidence as the College of Education shall require. Evaluations will be made on intelligence, academic aptitude, verbal fluency, interest in working with young people, and emotional maturity. A serious attempt will be made to assess these factors in their interrelationships rather than as isolated phenomena. Students accepted for the Upper Division standing will be expected to commit themselves to the remaining requirements of the program.

Students who are enrolled in other colleges of the university and who desire teacher certification will be expected to meet generally the requirements of all the above objectives.

### **Admission Requirements**

Important to the future teacher is high ability in the communication skills and adequate strength in the field of special interest. As important as the pattern and quality of an applicant's preparation are the personal qualifications which contribute to success in teaching.

All applicants are expected to have completed the following subject-matter units:

<b>Subject</b>	<b>Units</b>
English (4 years)	3
Mathematics (minimum)	1
Science (minimum)	1
Other college preparatory subjects	6
Electives, not more than	4
	15

Students who wish to major in the Teaching of Science and Mathematics must be able to present these units:

\*Algebra, through quadratics; Plane

Geometry and Trigonometry	3½ units
Physics and Chemistry	2 units

\*The full sequence of college preparatory Mathematics courses is strongly recommended.

It is desirable for students who wish to major in the Teaching of General Science to be able to present one unit in biology.

### **Transfers**

Students desiring advanced standing from other institutions will not be accepted beyond the Lower Division unless they have, in general, completed the requirements for admission to the Upper Division, including appropriate course work, and the testing program. It is recommended that such students make application not later than May 1 to the Admissions Office of the University for advanced standing the following September.

## **GRADUATION REQUIREMENTS**

### **Degrees**

The College of Education will award the degree of Bachelor of Science in Education to those who successfully complete the program of preparation for teaching at elementary or secondary school level.

### **Quantitative Requirements**

The required courses in each of the undergraduate curricula in the College of Education are indicated on the following pages. Each curriculum requires not less than 174 quarter hours of classwork, including one quarter of student teaching. At least 32 quarter hours will be required in Education, including student teaching.

### **Elective Courses**

Elective courses, approved by the Dean of the College of Education, will be selected by the student from among courses in the Colleges of Liberal Arts and Business Administration.

### **Qualitative Requirements**

Students in the College of Education will be expected to maintain an over-all average of C while doing work of C+ or better in the field of specialization and in the professional sequence in order to be recommended for placement. Students are warned that any failure seriously handicaps their records and must be made up at the earliest opportunity.

### **Graduation with Honor**

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

### **Cooperative Plan**

Upon successfully completing thirty-six weeks of academic work, students in the College of Education are placed on the Cooperative Plan. In this program periods of classroom work alternate with a variety of work experiences in industry, social service agencies, community organizations, etc. This program, which has proved to be of inestimable value in offering students both the theoretical and practical aspects of a broad education, is consistent with the philosophy of the College of Education.

Opportunities are increasing steadily for selected students to participate as employees of cooperating school departments. Assisting in administrative as well as instructional functions, the student enjoys unique opportunity to acquire broad viewpoints and rich experience which will greatly enhance his confidence and effectiveness as a teacher.

## National Teacher Examinations

All students who plan to make teaching their career will be expected to take the general and special National Teacher Examinations in their senior year.

## Programs of Instruction

Students in the College of Education will find a variety of fields of specialization available. For secondary teaching, there are Biology, Chemistry, Physics, General Science, Mathematics, Social Studies, English, and Modern Languages. Those interested in elementary teaching must complete a broader type of major, in Social Science, Humanities, Science and Mathematics or Reading-Language. Those wishing Science and Mathematics will follow a program adapted from the General Science program. Specimen programs are shown on the pages that follow.

## TEACHING OF ENGLISH

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
16.106	Earth Sci.	3	3	16.107	Earth Sci.	3	3	16.108	Earth Sci.	3
22.101	Intr. Pol. Sci.	3	3	22.102	Intr. Pol. Sci.	3	3	22.103	Intr. Pol. Sci.	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3
50.101	Soc. Sci.	3	3	50.102	Soc. Sci.	3	3	50.103	Soc. Sci.	3

## SECOND YEAR

QUARTER 4			QUARTER 5				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
23.130	England to 1688	4	4	23.131	England after 1688	4	4
30.170	English Literature	4	4	29.100	Public Speaking	3	3
39.115	Econ. Prin. & Prob.	4	4	30.171	English Literature	4	4
50.121	Human Dev. & Lrng. I	4	4	54.126	Sec. Reading	4	4

## THIRD YEAR

QUARTER 6			QUARTER 7				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
30.120	Intr. Linguistics	4	4	30.121	Found. of Eng.	4	4
30.180	Amer. Literature	4	4	30.181	Amer. Literature	4	4
50.131	Human Dev. & Lrng. II	4	4	51.135	Anal. Tchnq. & Ed. Process	4	4

## FOURTH YEAR

QUARTER 8			QUARTER 9				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
30.124	Tradit. Grammar	4	4	30.125	Grammatical Anal.	4	4
30.250	Shakespeare	4	4	30.251	Shakespeare	4	4
51.143	M.&M.-English	4	4	50.141	Meas. & Eval.	4	4
	Science or Math. Elec.	4	4		Sci. or Math. Elective	4	4

## FIFTH YEAR

QUARTER 10			QUARTER 11			
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	
30.104	Intermed. Writing	4	4	Electives	8	8
50.151	Bkgrnds. Amer. Ed.	4	4			
	Electives	8	8			
90.253	Prof. Dev.	1	1			

**TEACHING OF GENERAL SCIENCE****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
101	Basic Math.	3 3	10.102	Basic Math.	3 3	10.103	Basic Math.	3 3
121	Gen. Chem.	3(3) 4	12.122	Gen. Chem.	3(3) 4	12.123	Gen. Chem.	3(3) 4
111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
101	English	3 3	30.102	English	3 3	30.103	English	3 3
101	Soc. Science	3 3	50.102	Soc. Science	3 3	50.103	Soc. Science	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.106	Calculus	4 4	10.107	Calculus	4 4
11.136	Basic Physics	3(3) 4	11.137	Basic Physics	3(3) 4
12.141	Org. Chem. I	3(3) 4	12.142	Organic Chem. II	3(3) 4
50.121	Human Dev. & Lrng. I	4 4	29.100	Public Speaking	3 3

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.131	Oceanography I	4 4	16.132	Oceanography II	4 4
16.141	Prin. of Geology	4 4	16.161	Astronomy	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
50.131	Human Dev. & Lrng. II	4 4	51.135	Anal. Tchng., Ed. Process	4 4

**EARTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.158	Physiology I	4 4	18.159	Physiology II	4 4
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
51.147	M. & M.-Science	4 4	50.141	Meas. & Eval.	4 4
	Science Elective	4 4		Science Elective	4 4

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds. Amer. Ed. Electives	4 4 12 12		Electives	8 8
90.253	Prof. Dev.	1 1			

**TEACHING OF MATHEMATICS****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.201	Calculus	5	5	10.202	Calculus	5	5	10.203	Algebra	5
11.151	Physics	3	3	11.152	Physics	3	3	11.153	Physics	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3
50.101	Soc. Sci.	3	3	50.102	Soc. Sci.	3	3	50.103	Soc. Sci.	3

**SECOND YEAR**

QUARTER 4			QUARTER 5				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.204	Calculus	4	4	10.205	Calculus	4	4
10.206	Algebra	4	4	10.208	Probabilities	4	4
50.121	Human Dev. & Lrng. I	4	4	29.100	Public Speaking	3	3
	Human. Elective	4	4	51.124	Mod. Math. Curric.	4	4

**THIRD YEAR**

QUARTER 6			QUARTER 7				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.220	Math. Statistics	4	4	10.225	Computers, Logic	4	4
26.150	Intro. Logic	4	4	26.151	Symbolic Logic	4	4
30.180	Amer. Literature	4	4	30.181	Amer. Literature	4	4
50.131	Human Dev. & Lrng. II	4	4	51.135	Anal. Tchnq. & Ed. Process	4	4

**FOURTH YEAR**

QUARTER 8			QUARTER 9				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
*10.170	Geometry	4	4	*10.171	Geometry	4	4
	Math. Elective	4	4		Math. Elective	4	4
51.145	M. & M.-Math. Elective	4	4	50.141	Meas. & Eval. Elective	4	4

**FIFTH YEAR**

QUARTER 10			QUARTER 11				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
*10.273	Hist. of Math.	4	4	*10.274	Number Theory	4	4
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
50.151	Bkgrnds. Amer. Ed.	4	4		Elective	4	4
	Elective	4	4				
90.253	Prof. Dev.	1	1				

\*10.170, 10.171 and 10.273, 10.274 offered in alternate years. 10.273, 10.274 offered in 1967-68.

## TEACHING OF MODERN LANGUAGES

## 1ST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
Course	Cl.	Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16 Earth Science	3	3	16.107	Earth Science	3 3	16.108	Earth Science	3 3
11 West. Civ.	3	3	23.102	West. Civ.	3 3	23.103	West. Cult.	3 3
11 English	3	3	30.102	English	3 3	30.103	English	3 3
11 Soc. Science	3	3	50.102	Soc. Science	3 3	50.103	Soc. Science	3 3
Modern Lang.	3	3		Modern Lang.	3 3		Modern Lang.	3 3

## 2ND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Human Dev. & Lrng. 1	4 4	39.116	Econ. Prin. & Prob.	4 4
	Modern Lang.	4 4		Modern Lang.	4 4

## 3RD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.131	Human Devel. & Lrng. II	4 4	51.135	Anal. of Tchng. Mod. Lang.	4 4
	Mod. Lang.			Elective	4 4
	Elective	4 4		Mod. Lang.	4 4
	Mod. Lang.			Elective	4 4
	Elective	4 4		Science	4 4
	Science			Elective	4 4
	Elective	4 4			

## 4TH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.120	Intro. Linguistics	4 4	30.171	English Literature	4 4
30.170	English Literature	4 4	50.141	Meas. & Eval.	4 4
51.140	M.&M. Mod. Lang.	4 4		Mod. Lang.	4 4
	Mod. Lang.			Elective	4 4
	Elective	4 4		Mod. Lang.	4 4
				Elective	4 4

## 5TH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds. Amer. Ed.	4 4		Electives	8 8
	Mod. Lang.				
	Elective	4 4			
	Mod. Lang.				
	Elective	4 4			
	Elective	4 4			
90.253	Prof. Dev.	1 1			

**ELEMENTARY TEACHING — HUMANITIES****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Sci.	3	16.107	Earth Sci.	3	16.108	Earth Sci.	3
22.101	Intr. Pol. Sci.	3	22.102	Intr. Pol. Sci.	3	22.103	Intr. Pol. Sci.	3
23.101	West. Civ.	3	23.102	West. Civ.	3	23.103	West. Civ.	3
30.101	English	3	30.102	English	3	30.103	English	3
50.101	Soc. Sci.	3	50.102	Soc. Sci.	3	50.103	Soc. Sci.	3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.121	Nat. Hist. I	4	16.122	Nat. Hist. II	4
27.113	Creat. Draw.	(6)	29.100	Public Speaking	3
39.115	Econ. Prin. & Prob.	4	Elective	4	4
50.121	Hum. Dev. & Lrng. I	4	Human. Elective	4	4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.131	Hum. Dev. & Lrng. II	4	51.132	Fund. of Arith. II	4
51.131	Fund. of Arith. I	4	51.135	Anal. Tchng., Ed. Proc.	4
54.135	Elem. Reading I	4	54.136	Elem. Reading II	4
	Human. Elective	4		Human. Elective	4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4	23.211	U.S. after 1865	4
51.141	Elem. Ed. Compend. I	4	51.142	Elem. Ed. Compend. II	4
	Elective	4	50.141	Meas. & Eval. Art Elective	4
	Human. Elective	4			4

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	Amer. Literature	4	30.181	Amer. Literature	4
50.151	Bkgrnds. Amer. Ed.	4		Art Elective	4
55.121	Intr. Spec. Ed.	4			4
	Elective	4			4
90.253	Prof. Dev.	1			1

## ELEMENTARY TEACHING SCIENCE — MATHEMATICS

**ST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	
01 Basic Math.	3 3	10.102	Basic Math.	3 3	10.103	Basic Math.	3 3	
06 Earth Sci.	3 3	16.107	Earth Sci.	3 3	16.108	Earth Sci.	3 3	
01 West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3	
01 English	3 3	30.102	English	3 3	30.103	English	3 3	
01 Soc. Sci.	3 3	50.102	Soc. Sci.	3 3	50.103	Soc. Sci.	3 3	

**OND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.135	Gen. Chem.	3(3) 4	12.136	Gen. Chem.	3(3) 4
16.121	Nat. Hist. I	4 4	16.122	Nat. History II	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Human Dev. & Lrng. I	4 4		Human. Elective	4 4

**RD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.136	Basic Physics	3(3) 4	11.137	Basic Physics	3(3) 4
50.131	Human Dev. & Lrng. II	4 4	51.132	Fund. of Arith. II	4 4
51.131	Fund. of Arith. I	4 4	51.135	Anal. Tchng. & Ed. Proc.	4 4
54.135	Elem. Reading I	4 4	54.136	Elem. Reading II	4 4

**URTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.131	Oceanography I	4 4	16.132	Oceanography II	4 4
16.141	Prin. of Geology	4 4	23.211	U.S. after 1865	4 4
23.210	U.S. to 1865	4 4	50.141	Meas. & Eval.	4 4
51.141	Elem. Ed. Compnd. I	4 4	51.142	Elem. Ed. Compnd. II	4 4

**TH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.181	Amer. Literature I	4 4	26.133	Philos. Sci.	4 4
50.151	Bkgrnds. Amer. Ed.	4 4	30.181	Amer. Literature II	4 4
55.121	Int. Spec. Ed.	4 4			
90.253	Prof. Dev.	1 1			
	Human. Elective	4 4			

# ELEMENTARY TEACHING

## SOCIAL SCIENCE

**FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Sci.	3 3	16.107	Earth Sci.	3 3	16.108	Earth Sci.	3 3
22.101	Intr. Pol. Sci.	3 3	22.102	Intr. Pol. Sci.	3 3	22.103	Intr. Pol. Sci.	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.101	Soc. Science	3 3	50.102	Soc. Science	3 3	50.103	Soc. Science	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.121	Nat. History I	4 4	16.122	Nat. History II	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Human. Dev. & Lrng. I	4 4		Human. Elective	4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.131	Human Dev. & Lrng. II	4 4	51.132	Fund. of Arith. II	4 4
51.131	Fund. of Arith. I	4 4	51.135	Anal. Tchng. & Ed. Proc.	4 4
54.135	Elem. Reading I	4 4	54.136	Elem. Reading II	4 4
	History Elective	4 4		History Elective	4 4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
22.151	Comp. Govt.	4 4	22.131	Amer. Govt.	4 4
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
54.141	Elem. Ed. Compend. I	4 4	50.141	Meas. & Eval.	4 4
	History Elective	4 4	51.142	Elem. Ed. Compend. II	4 4

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds. Amer. Ed.	4 4		Elective	4 4
55.121	Intr. Spec. Ed.	4 4		Human. Elective	4 4
	Elective	4 4			
90.253	Prof. Dev.	1 1			
	Human. Elective	4 4			

## ELEMENTARY TEACHING LANGUAGE-READING

**RST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
.106	Earth Sci.	3 3	16.107	Earth Sci.	3 3	16.108	Earth Sci.	3 3
.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
.101	English	3 3	30.102	English	3 3	30.103	English	3 3
.101	Soc. Sci.	3 3	50.102	Soc. Sci.	3 3	50.103	Soc. Sci.	3 3
	Mod. Lang.	3 3		Mod. Lang.	3 3		Mod. Lang.	3 3

**ECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.121	Nat. History I	4 4	16.122	Nat. History II	4 4
39.115	Econ. Prin. & Prob.	4 4	29.100	Public Speaking	3 3
50.121	Human Dev. & Lng. I	4 4		Modern Lang. or Human. Elective	4 4
	Modern Lang. or Human. Elective	4 4		Elective	4 4

**HIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.120	Intro. Linguistics	4 4	30.121	Found. of Eng.	4 4
50.131	Human Dev. & Lng. II	4 4	51.132	Fund. of Arith. II	4 4
51.131	Fund. of Arith. I	4 4	51.135	Anal. Tchng., Ed. Proc.	4 4
54.135	Elem. Reading I	4 4	54.136	Elem. Reading II	4 4

**DURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.124	Tradit. Grammar	4 4	30.125	Grammatical Anal.	4 4
51.141	Elem. Ed. Compend. I	4 4	50.141	Meas. & Eval.	4 4
54.141	Remedial Reading	4 4	51.142	Elem. Ed. Compend. II	4 4
55.131	Dynamics of Speech & Lang. Dev.	4 4	54.142	Linguistics & Reading	4 4

**IFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
30.180	Amer. Literature I	4 4	30.181	Amer. Literature II	4 4
50.151	Bkgrnds. Amer. Ed.	4 4			
54.151	Children's Lit.	4 4			
90.253	Prof. Dev.	1 1			

**TEACHING OF BIOLOGY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.101	Basic Math.	3 3	10.102	Basic Math.	3 3	10.103	Basic Math.	3
12.121	Chemistry	3(3) 4	12.122	Chemistry	3(3) 4	12.123	Chemistry	3(3)
18.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3)
30.101	English	3 3	30.102	English	3 3	30.103	English	3
50.101	Soc. Sci.	3 3	50.102	Soc. Sci.	3 3	50.103	Soc. Sci.	3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.141	Organic Chem.	3(3) 4	12.142	Organic Chem.	3(3) 4
18.150	Comp. Vert.		18.155	Dev. Anat.	3(6) 5
	Anat.	3(6) 5	23.211	U.S. after 1865	4 4
23.210	U.S. to 1865	4 4	29.100	Public Speaking	3 3
50.121	Human Dev. I	4 4			

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.136	Basic Physics	3(3) 4	11.137	Basic Physics	3(3) 4
18.210	Inv. Zoology	3(6) 5	18.200	Genetics	3(3) 4
50.131	Human Dev. II	4 4	51.135	Anal. Tchnq.	4 4
	Biology Elective	4 4		Biology Elective	4 4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
51.147	M. & M. Science	4 4	50.141	Meas. & Eval.	4 4
	Biology Elective	4 4		Biology Elective	4 4
	Human. Elective	4 4	26.133	Philos. of Sci.	4 4
	Elective	4 4		Human. Elective	4 4

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.258	Physiology	3(3) 4	18.259	Cell Physiology	3(3) 4
30.180	Amer. Lit. I	4 4	30.181	Amer. Lit. II	4 4
50.151	Bkgrnds. Amer. Ed.	4 4			
	Biology Elective	4 4			
90.253	Prof. Dev.	1 1			

**TEACHING OF CHEMISTRY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
1.111	Calculus	3 3	10.112	Calculus	3 3	10.113	Calculus	3 3
2.131	Chemistry	3(3) 4	12.132	Chemistry	3(3) 4	12.133	Chemistry	3(6) 5
1.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
1.101	English	3 3	30.102	English	3 3	30.103	English	3 3
1.101	Soc. Sci.	3 3	50.102	Soc. Sci.	3 3	50.103	Soc. Sci.	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.144	Calculus	4 4	10.145	Calculus	4 4
11.120	Physics	4(4) 5	11.121	Physics	4(4) 5
12.153	Organic Chem.	3(3) 4	12.154	Organic Chem.	3(3) 4
50.121	Human Dev. & Lrng. I	4 4	29.100	Public Speaking	3 3

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.155	Organic Chem.	3(6) 5	12.162	Physical Chem.	4(3) 5
12.161	Physical Chem.	4(3) 5	12.176	Analytical Chem.	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
50.131	Human Dev. & Lrng. II	4 4	51.135	Anal. Tchnq. & Ed. Proc.	4 4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.163	Physical Chem.	3(3) 4	12.178	Analytical Chem.	1(6) 3
12.177	Analytical Chem.	3(6) 5	50.141	Meas. & Eval.	4 4
51.147	M. & M. Science	4 4		Human. Elective	4 4
	Human. Elective	4 4		Elective	4 4

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds. Amer. Ed.	4 4		Chem. Elective	4 4
	Chem. Elective	4 4		Elective	4 4
	Electives	8 8			
90.253	Prof. Dev.	1 1			

**TEACHING OF PHYSICS****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.201	Calculus	5	5	10.202	Calculus	5	5	10.203	Algebra	5
11.151	Physics	3	3	11.152	Physics	3	3	11.153	Physics	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3
50.101	Soc. Sci.	3	3	50.102	Soc. Sci.	3	3	50.103	Soc. Sci.	3

**SECOND YEAR**

QUARTER 4			QUARTER 5				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.204	Calculus	4	4	10.205	Calculus	4	4
11.154	Physics	4	4	11.155	Physics	4	4
11.164	Physics Lab.	(3)	1	11.165	Physics Lab.	(3)	1
50.121	Human Dev. & Lrng. I	4	4	29.100	Public Speaking	3	3
	Elective	4	4		Elective	4	4

**THIRD YEAR**

QUARTER 6			QUARTER 7				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.251	Analysis	4	4	10.252	Analysis	4	4
11.200	Mechanics I	4	4	11.201	Mechanics II	4	4
11.260	Wave Lab.	2(3)	3	11.261	Exp. Lab.	1(3)	2
50.131	Human Dev. & Lrng. II	4	4	51.135	Anal. Tchng. & Ed. Process	4	4
	Elective	4	4		Elective	4	4

**FOURTH YEAR**

QUARTER 8			QUARTER 9				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
11.220	Thermo. & Kin. Theory	4	4	11.230	Mod. Physics	4	4
12.135	Gen. Chemistry	3(3)	4	12.136	Gen. Chemistry	3(3)	4
23.210	U.S. to 1865	4	4	23.211	U.S. after 1865	4	4
51.147	M. & M. Science	4	4	50.141	Meas. & Eval.	4	4

**FIFTH YEAR**

QUARTER 10			QUARTER 11				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
30.180	Amer. Literature	4	4	30.181	Amer. Literature	4	4
50.151	Bkgrnds. Amer. Ed.	4	4		Physics Elective	4	4
	Physics Elective	4	4		Human. Elective	4	4
	Human. Elective	4	4				
90.253	Prof. Dev.	1	1				

## TEACHING OF SOCIAL STUDIES

### FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
6.106	Earth Sci. I	3 3	16.107	Earth Sci. II	3 3	16.108	Earth Sci. III	3 3
22.101	Intr. Pol. Sci.	3 3	22.102	Intr. Pol. Sci.	3 3	22.103	Intr. Pol. Sci.	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.101	Soc. Science	3 3	50.102	Soc. Science	3 3	50.103	Soc. Science	3 3

### SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
26.150	Intro. Logic	4 4	29.100	Public Speaking	3 3
39.115	Econ. Prin. & Prob.	4 4	39.116	Econ. Prin. & Prob.	4 4
50.121	Human Dev. & Lrng. I	4 4	54.126	Sec. Reading	4 4

### THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.125	Modern Europe	4 4	22.131	Amer. Govt.	4 4
23.199	Historian's Craft	4 4	30.181	Amer. Literature	4 4
30.180	Amer. Literature	4 4	39.280	Comp. Econ. Syst.	4 4
50.131	Human Dev. & Lrng. II	4 4	51.135	Anal. Tchng. & Ed. Process	4 4

### FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
22.221	Internat. Relations	4 4	50.141	Meas. & Eval.	4 4
51.149	M.&M.—Social Stud.	4 4		Pol. Sci. Elec.	4 4
	History Elective	4 4		Human. Elective	4 4
	Human. Elective	4 4		History Elective	4 4

### FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
22.271	Political Theory	4 4		History Elective	4 4
50.151	Bkgrnds. Amer. Ed.	4 4		Sci./Math. Elective	4 4
	History Elective	4 4			
	Sci./Math. Elective	4 4			
90.253	Prof. Dev.	1 1			

**SPEECH AND HEARING THERAPY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Sci. I	3 3	16.107	Earth Sci. II	3 3	16.108	Earth Sci. III	3 3
22.101	Intr. Pol. Sci.	3 3	22.102	Intr. Pol. Sci.	3 3	22.103	Intr. Pol. Sci.	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.101	Soc. Sci.	3 3	50.102	Soc. Sci.	3 3	50.103	Soc. Sci.	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
39.115	Econ. Prin. & Prob.	4 4	55.122	Intr. Spch. & Hrng. Ther.	4 4
50.121	Human Dev. & Lrng. I	4 4	55.124	Anat Sp. & Hrg. Skills	4 4
55.121	Intr. Spec. Ed.	4 4	55.126	Communic. Skills	4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.131	Human Dev. & Lrng. II	4 4	19.135	Psych. Personality	4 4
54.135	Elem. Reading I	4 4	51.135	Anal. Tchnq. & Ed. Process	4 4
55.131	Dyn. of Spch. & Lang. Dev.	4 4	55.134	Organic Sp. Disorders	4 4
55.133	Intro. Ling. & Phonetics	4 4		Human. Elective	4 4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	Amer. Literature	4 4	30.181	Amer. Literature	4 4
55.141	M.&M. in Speech	4 4	50.141	Meas. & Eval.	4 4
55.143	Diagnosis	4 4	55.142	Intr. Audiology	4 4
55.145	Sp. & Hrg. Func. Sp. Disorders	4 4	55.144	Clinical Pract. I	2(6) 4

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.151	Bkgrnds. Amer. Ed.	4 4	55.152	Speech Reading & Audit Training	4 4
55.155	Clinical Pract. II	2(6) 4	55.154	Intr. Stutt.	4 4
	Human. Elective	4 4			
	Sci. or Math. Elective	4 4			
90.253	Prof. Dev.	1 1			



## *College of Liberal Arts*

**Dr. Wilfred S. Lake, Dean**

**Dr. Norman Rosenblatt, Assistant Dean**

**Dr. Arthur E. Vernon, Director of  
The Graduate School of Arts and Sciences**



## Aims

The College of Liberal Arts seeks to guide young men and women toward intellectual maturity. The mature person is aware of the significant phenomena of the world and has the ability to cope with them effectively and creatively.

To help the student understand the conditions of man's existence, the College of Liberal Arts requires him to study ideas and experiences that are the subject matter of a variety of disciplines. To prepare him to play an effective role in the world, a departmental curriculum helps him to master the concepts and methods of a specific discipline. Detailed study of a field is essential to liberal education, for only through specialization can a student acquire insight into the intellectual processes which form the basis of all knowledge. Broader study is equally necessary for effective action, for only through variety of inquiry can a student gain perspective about his rights and responsibilities as an individual and about the importance and limitations of his specialty.

Northeastern University's Cooperative Plan contributes to a liberal education by providing valuable opportunities for the student to test and extend his understanding of the complex world and of his special field through direct experience and practical application.

At best, however, the brevity of his own undergraduate experience and the vastness of human experience permit the student only to start, not to complete, his education. Moreover, education is an unending process because man's understanding of the world continually changes and grows. Consequently, the most enduring contribution a college of liberal arts can make is to help the individual acquire the skill and motivation to continue his intellectual development throughout his life.

## Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of electives is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields. Therefore, a definite series of basic courses in each curriculum is required by the faculty. These required courses are largely concentrated in the first two years of the curriculum.

Through a comprehensive guidance program students are directed in their selection of courses so that they obtain the proper preparation for their intended vocations. Specialization in a major field is emphasized during the latter part of the curriculum and is facilitated by the opportunity for electing certain courses in the other Basic Colleges of the University.

Through the Northeastern plan of cooperative education for upperclassmen, the student makes early contact with actual working conditions and profits by the wholesome experience of earning at least part of the money to defray col-

lege expenses. Viewed as a whole, then, the college years surround the student not with an artificial atmosphere of cloistered scholarship but with an environment very close to that which he or she will enter after graduation, and thus tend to make for more ready employment, an essential element of vocational competence. The curricula in the College of Liberal Arts afford not only a broad cultural training but also the necessary foundation for a wide range of vocations for both young men and young women.

### **Admission Requirements**

The College of Liberal Arts offers three broad areas of study. Since the freshman-year program is different in each of these areas, entrance requirements also vary.

All curricula:

<b>Subject</b>	<b>Units</b>
English (4 years)	3
Foreign language (at least 2 years)	2
Mathematics (at least 1 year)	1
Science (at least 1 year)	1
Other college preparatory subjects	4
Electives, not more than	4
	15

The following curricula must include these mathematics and science units:

Biology—Chemistry curricula (including Medical Technology, Premedical, and Predental programs)

Algebra, through quadratics, and	
Plane Geometry	3 units
Biology and Chemistry	2 units

Science curricula (Physics and Mathematics)

Applicants are required to show particular strength in mathematics through the full sequence of college preparatory courses. In addition, the successful completion of physics is required.

### **GRADUATION REQUIREMENTS**

#### **Degrees**

The College of Liberal Arts awards the Bachelor of Arts degree to qualified candidates who have completed any one of the curricula offered.

### Quantitative Requirements

Candidates for a degree must have completed one of the curricula listed on pages 98-112 and in their required and elective courses must complete at least 16 quarter hours of work in each of the following areas:

I. Science and Mathematics	Biology, Chemistry, Geology, Mathematics, Natural Science, Physics, or Psychology (laboratory courses).
II. Humanities	Art, Drama, Literature and Languages (excluding freshman English and elementary language), Philosophy, or Speech.
III. Social Sciences	Economics, History, Political Science, Psychology, or Sociology-Anthropology.

All candidates for a degree must have satisfactorily completed in college one year of a modern foreign language above the elementary level.

Students who undertake cooperative work assignments must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

The final three quarters immediately preceding graduation must be completed in residence at Northeastern.

### Qualitative Requirements

An average grade of C is required for graduation.

### Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

### Curricular Requirements

The required courses in each curriculum are indicated on the following pages. Upon petition to the faculty, substitutions may be permitted in exceptional cases when required by the specific vocational objective of the student.

During the last year students in all curricula may take 90.251 Placement Techniques, designed to prepare them for placement in specific positions in their chosen vocational field. Under expert guidance each student prepares a complete personnel record, studies himself or herself and the opportunities that are open, and works out a complete campaign for obtaining after-graduation employment.

## **Combined Program with Professional Schools**

Students who have completed at least three-quarters of the work required for the baccalaureate degree at Northeastern University before entering an approved professional school of dentistry, law, or medicine, will be granted the Bachelor of Arts degree at the end of the second year in professional school, provided at least two-thirds of the work for the baccalaureate degree has been earned in residence at Northeastern and all other graduation requirements have been fulfilled. The residence requirement at Northeastern University must have been completed immediately prior to entrance into the professional school. Under this plan preprofessional students may reduce by one year the time ordinarily required for obtaining both degrees.

## **Four-Year Plan**

All curricula in the College of Liberal Arts are normally organized on the five-year Cooperative Plan, which is the distinctive feature of Northeastern University.

However, in all majors except Chemistry and Medical Technology, qualified students may be excused from the Cooperative Plan by the Academic Standing Committee and may complete the requirements for the degree in four years.

## **Honors Program**

An honors program is provided in the College of Liberal Arts to enable superior students to develop their potential to the highest degree by making it possible for them to pursue studies in their major fields to greater depth than is possible in the regular courses.

The nature of the program is determined by the academic department concerned. Programs may involve any of the following elements: special research projects culminating in honor theses, honor seminars, reading projects, directed independent study, or creative work. Flexibility is the keynote, with every consideration being given to the individual needs and requirements of the student.

The program is open to junior and senior students approved by the Faculty Honors Committee. To be eligible a student must have a grade-point average of 3.0 with no grade below B in all courses in the major field after the freshman year. The latter requirement may be waived by the Honors Committee on recommendation of the Department Chairman in exceptional cases.

**BIOLOGY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.111	Gen. Biology	2(3) 3	18.112	Gen. Biology	2(3) 3	18.113	Gen. Biology	2(3) 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
10.101	Basic Math. or Calculus	3 3	10.102	Basic Math. or Calculus	3 3	10.103	Basic Math. or Calculus	3 3
12.121	Gen. Chem. or Mod. Lang.	3(3) 4	12.122	Gen. Chem. or Mod. Lang.	3(3) 4	12.123	Gen. Chem. or Mod. Lang.	3(3) 4
12.131	Gen. Chem. Mod. Lang.	3(3) 4	12.132	Gen. Chem. Mod. Lang.	3(3) 4	12.133	Gen. Chem. Mod. Lang.	3(6) 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.141	Org. Chem. I	3(3) 4	12.142	Org. Chem. II	3(3) 4
18.150	Comp. Vert. Anatomy	3(6) 5	18.155	Dev. Anatomy	3(6) 4
20.100	Prin. Soc. Anthr. or Mod. Lang.	4 4	21.100	Prin. Soc. or Elective	4 4
26.101	Intr. Phil. I Mod. Lang. or Elective	4 4	26.102	Intr. Phil. II Mod. Lang. or Elective	4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.130	Gen. Physics	4 4	18.200	Genetics	3(3) 4
12.143	Org. Chem. III	3(3) 4		Elective	4 4
18.210	Invert. Zoology Elective	3(6) 5		Elective	4 4
		*		Elective	*

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.131	Gen. Physics	3(3) 4	11.132	Gen. Physics	3(3) 4
12.171	Anal. Chem. Biology Elective	3(3) 4		Biology Elective	4 4
		4		Elective	4 4
		*		Elective	*

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.258	Cell Physiol. Biology Elective	3(3) 4	18.259	Cell. Physiol. Biology Elective	3(3) 4
		4		Elective	4 4
		4		Elective	4 4
		*		Elective	*

\*A total of 40 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**CHEMISTRY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
0.111	Calculus	3 3	10.112	Calculus	3 3	10.113	Calculus	3 3
2.131	Gen. Chem.	3(3) 4	12.132	Gen. Chem.	3(3) 4	12.133	Gen. Chem.	3(6) 5
8.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
0.101	English	3 3	30.102	English	3 3	30.103	English	3 3
	Mod. Lang. (Ger. or Russ.)	3 3		Mod. Lang. (Ger. or Russ.)	3 3		Mod. Lang. (Ger. or Russ.)	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.144	Calculus	4 4	10.145	Calculus	4 4
11.120	Physics	4(4) 5	11.121	Physics	4(4) 5
12.153	Organic Chem.	3(3) 4	12.154	Organic Chem.	3(3) 4
	Mod. Lang. or Elective	4 4		Mod. Lang. or Elective	4 4
		4 4			4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.155	Org. Chem.	3(6) 5	10.207	Diff. Equations	4 4
12.161	Phys. Chem.	4(3) 5	12.162	Phys. Chem.	4(3) 5
	Electives	*	12.176	Anal. Chem.	4 4
				Elective	*

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.163	Phys. Chem.	3(3) 4	12.178	Anal. Chem.	1(6) 3
12.177	Anal. Chem.	3(6) 5	12.182	Chem. Lit.	2 2
	Electives	*		Electives	*

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.211	Adv. Inorg. Chem.	2 2	12.212	Adv. Inorg. Chem.	2 2
12.253	Ident. Org. Com.	1(6) 3	12.284	Adv. Chem. Syn. or	(9) 3
12.251	Adv. Org. Chem.	4 4	12.286	Adv. Chem. Meas. Electives	(9) 3
	or				*
12.261	Adv. Phys. Chem.	4 4			
	Electives	*			

A total of 37 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**DRAMA****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Science	3 3	16.107	Earth Science	3 3	16.108	Earth Science	3 3
22.101	Intr. Pol. Sci. I	3 3	22.102	Intr. Pol. Sci. II	3 3	22.103	Intr. Pol. Sci. III	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English Mod. Lang.	3 3	30.102	English Mod. Lang.	3 3	30.103	English Mod. Lang.	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
29.110	Voice and Artic.	4 4	29.150	Acting	4 4
29.200	Hist. of Theater	4 4	29.201	Hist. of Theater	4 4
19.107	Gen. Psych. I or Elective	3(2) 4	19.108	Gen. Psych. II or Elective	3(2) 4
20.100	Prin. Soc. Anthr. Mod. Lang.	4 4	21.100	Prin. Sociology Mod. Lang.	4 4
	or Elective	4 4		or Elective	4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
29.170	Scenic Prod. Electives	4 4 *		Drama Elective Electives	4 4 *

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
29.160	Concepts of Dir. Drama Elective Electives	4 4 4 4 *		Drama Elective Drama Elective Electives	4 4 4 4 *

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Drama Elective Drama Elective Electives	4 4 4 4 *	29.280	Senior Project Drama Elective Electives	4 4 4 4 *

\*A total of 58 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**ECONOMICS****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
6.106	Earth Science	3 3	16.107	Earth Science	3 3	16.108	Earth Science	3 3
2.101	Intr. Pol. Sci. I	3 3	22.102	Intr. Pol. Sci. II	3 3	22.102	Intr. Pol. Sci. III	3 3
3.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
0.101	English	3 3	30.102	English	3 3	30.103	English	3 3
	Mod. Lang.	3 3		Mod. Lang.	3 3		Mod. Lang.	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.104	Fund. of Math.	4 4	10.105	Fund. of Math.	4 4
20.100	Prin. Soc. Anthrop.	4 4	21.100	Prin. Sociology	4 4
39.115	Prin. & Probs. Econ. Mod Lang. or Elective	4 4 4 4 4 4 4 4	39.116	Prin. & Prob. Econ. Mod. Lang. or Elective	4 4 4 4 4 4 4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
19.107	Gen. Psych. I	3(2) 4	19.108	Gen. Psych. II	3(2) 4
39.250	Statistics	4 4	39.251	Statistics	4 4
39.255	MicroEco. Th.	4 4	39.256	MacroEco. Th.	4 4
	Elective	*		Elective	*

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Econ. Elective Electives	4 4 *		Econ. Elective Electives	4 4 *

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Econ. Elective	4 4		Econ. Elective	4 4
	Econ. Elective	4 4		Econ. Elective	4 4
	Electives	*		Electives	*

A total of 50 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**ENGLISH AND ENGLISH-JOURNALISM****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3					
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.			
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English Mod. Lang.	3	3	30.102	English Mod. Lang.	3	3	30.103	English Mod. Lang.	3	3

**SECOND YEAR**

QUARTER 4			QUARTER 5				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
23.130	Eng. to 1688	4	4	23.131	Eng. since 1688	4	4
30.110	Lit. Analysis	4	4	30.111	Lit. Anal. Novel or	4	4
26.101	Intr. to Phil. I or Prin. of Soc.	4	4	30.112	Lit. Anal. Drama	4	4
20.100	Anthr. Mod. Lang. or Elective	4	4	26.102	Intr. to Phil. II or	4	4
		4	4	20.103	Elem. of Cult. Anthr. Mod. Lang. or Elective	4	4

**THIRD YEAR**

QUARTER 6			QUARTER 7				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
30.174	Eng. Lit. I		30.175	Eng. Lit. II			
38.103	News Writing or Eng. Elect.	4	4	38.104	News Writing Eng. Elect. Electives	4	4
	Electives	4	*		*		

**FOURTH YEAR**

QUARTER 8			QUARTER 9				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
30.176	Eng. Lit. III Eng. Elec. or	4	4	30.177	Eng. Lit. IV Eng. Elec. or	4	4
38.105	Tech. Journ. Electives	4	4	38.106	Tech. Journ. Electives	4	4
	*				*		

**FIFTH YEAR**

QUARTER 10			QUARTER 11			
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	
	Eng. Elec.	4	4	Eng. Elec.	4	4
	Eng. Elec.	4	4	Electives	*	
	Electives	*				

\*A total of 54 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**HISTORY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Science	3    3	16.107	Earth Science	3    3	16.108	Earth Science	3    3
22.101	Intr. Pol. Sci. I	3    3	22.102	Intr. Pol. Sci. II	3    3	22.103	Intr. Pol. Sci. III	3    3
23.101	West. Civ.	3    3	23.102	West. Civ.	3    3	23.103	West. Civ.	3    3
30.101	English Mod. Lang.	3    3	30.102	English Mod. Lang.	3    3	30.103	English Mod. Lang.	3    3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4    4	21.100	Prin. Sociol.	4    4
26.101	Intr. Phil. I	4    4	23.211	U.S. since 1865	4    4
39.115	Prin. & Prob. Econ. Mod. Lang. or Elective	4    4	39.116	Prin. & Prob. Econ. Mod. Lang. or Elective	4    4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.199	Hist's Craft	4    4		History Elec.	4    4*
	History Elec.	4    4*		History Elec.	4    4*
	Electives	**		Electives	**

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	History Elec.	4    4*		History Elec.	4    4*
	History Elec.	4    4*		History Elec.	4    4*
	Electives	**		Electives	**

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	History Elec.	4    4*		History Elec.	4    4*
	History Elec.	4    4*		Electives	**
	Electives	**			

\*For information about distribution of History Electives, see Department of History.

\*\*A total of 54 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**MATHEMATICS****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3					
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.			
10.201	Calculus	5	5	10.203	Algebra	5	5	10.202	Calculus	5	5
11.151	Physics	3	3	11.152	Physics	3	3	11.153	Physics	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

**SECOND YEAR**

QUARTER 4			QUARTER 5				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.204	Calculus	4	4	10.205	Calculus	4	4
10.206	Algebra	4	4	10.208	Probability	4	4
11.104	Physics	3	3	10.207	Differ. Equat.	4	4
	and			11.105	Physics	3	3
11.110	Physics Lab	(3)	1	11.111	Physics Lab	(3)	1
	or			12.136	Gen. Chem.	4	4
12.135	Gen. Chem.	3(3)	4	Mod. Lang.	4	4	
	or			or			
	Elective	4	4	Elective	4	4	

**THIRD YEAR**

QUARTER 6			QUARTER 7				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.251	Analysis	4	4	10.252	Analysis	4	4
10.220	Math. Stat.	4	4	10.207	Differ. Equat.	4	4
	or				or		
	Elective	4	4	Elective	4	4	
	Electives	*		Electives	*		

**FOURTH YEAR**

QUARTER 8			QUARTER 9				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.221	Applied Anal.	4	4	10.222	Applied Anal.	4	4
	or				or		
10.254	Algebra	4	4	10.255	Algebra	4	4
	Electives	*		Electives	*		

**FIFTH YEAR**

QUARTER 10			QUARTER 11				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.223	Num. Anal.	4	4	10.224	Num. Anal.	4	4
	or				or		
10.253	Analysis	4	4	Math. Elec.	4	4	
	Electives	*		Electives	*		

\*A total of 66 quarter hours of additional electives, including two hours of Physical Education must be taken in order to meet the graduation requirement of 176 quarter hours. For the applied option, these must include 16 quarter hours of approved science or engineering courses.

Where a choice of mathematics courses is shown, the first course listed must be selected by students choosing the applied mathematics option. In Quarters 8, 9, and 10, the second course listed must be taken by students selecting the pure mathematics option.

**MEDICAL TECHNOLOGY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.101	Basic Math.	3 3	10.102	Basic Math.	3 3	10.103	Basic Math.	3 3
or			or			or		
10.111	Calculus	3 3	10.112	Calculus	3 3	10.113	Calculus	3 3
Gen. Chem.		3(3) 4	12.122	Gen. Chem.	3(3) 4	12.123	Gen. Chem.	3(3) 4
or			or			or		
12.131	Gen. Chem.	3(3) 4	12.132	Gen. Chem.	3(3) 4	12.133	Gen. Chem.	3(6) 5
18.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
Mod. Lang.		3 3	Mod. Lang.		3 3	Mod. Lang.		3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.141	Org. Chem.	3(3) 4	12.142	Org. Chem.	3(3) 4
18.140	Hematology	3(3) 4	18.120	Basic Microbiol.	3(4) 4
20.100	Prin. Soc. Anthr.	4 4	21.100	Prin. Soc.	4 4
or			or		
26.101	Intr. Phil. I	4 4	26.102	Intr. Phil. II	4 4
Mod. Lang.		4 4	Mod. Lang.		4 4
or			or		
Elective		4 4	Elective		4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.130	Gen. Physics	4 4	18.200	Genetics	3(3) 4
12.143	Org. Chem.	3(3) 4	18.225	Animal Histol.	2(3) 3
18.150	Comp. Vert.		Biology Elec.		4
Anat.		3(6) 5	Elective		*
Elective		*			

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.131	Gen. Physics	3(3) 4	11.132	Gen. Physics	3(3) 4
12.171	Anal. Chem.	3(3) 4	Biology Elec.		4
18.226	Animal Histol.	2(3) 3	Electives		*
Elective		*			

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.258	Cell Physiol.	3(3) 4	18.259	Cell Physiol.	3(3) 4
Biology Elec.		4	Electives		*
Electives		*			

\*A total of 33 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

18.116 Clinical Pathology, a 4-wk., 4-credit course, is taken during the first co-op work period.

**MODERN LANGUAGES****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3					
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.			
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English	3	3	30.102	English	3	3	30.103	English	3	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3	3

**SECOND YEAR**

QUARTER 4			QUARTER 5				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
23.210	U.S. to 1865	4	4	23.211	U.S. since 1865	4	4
30.170	Surv. Eng. Lit.	4	4	30.171	Surv. Eng. Lit.	4	4
39.115	Prin. & Prob. Econ. Mod. Lang. or Elective	4	4	39.116	Prin. & Prob. Econ. Mod. Lang. or Elective	4	4

**THIRD YEAR**

QUARTER 6			QUARTER 7			
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4	Adv. Lang. Elec.	4	4
	Electives	*		Electives	*	

**FOURTH YEAR**

QUARTER 8			QUARTER 9			
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4	Adv. Lang. Elec.	4	4
	Adv. Lang. Elec.	4	4	Adv. Lang. Elec.	4	4
	Electives	*		Electives	*	

**FIFTH YEAR**

QUARTER 10			QUARTER 11			
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	
	Adv. Lang. Elec.	4	4	Adv. Lang. Elec.	4	4
	Adv. Lang. Elec.	4	4	Adv. Lang. Elec.	4	4
	Electives	*		Electives	*	

\*A total of 58 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**PHILOSOPHY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
6.106	Earth Science	3 3	16.107	Earth Science	3 3	16.108	Earth Science	3 3
12.101	Intr. Pol. Sci. I	3 3	22.102	Intr. Pol. Sci. II	3 3	22.103	Intr. Pol. Sci. III	3 3
13.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
10.101	English	3 3	30.102	English	3 3	30.103	English	3 3
	Mod. Lang.	3 3		Mod. Lang.	3 3		Mod. Lang.	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
19.107	Gen. Psych. I	3(2) 4	19.108	Gen. Psych. II	3(2) 4
20.100	Prin. Soc. Anthro.	4 4	21.100	Prin. Soc.	4 4
26.101	Intr. Phil. I Mod. Lang. or Elective	4 4 4 4 4 4	26.102	Intr. Phil. II Mod. Lang. or Elective	4 4 4 4 4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
26.150	Intr. Logic Electives	4 4 * *	26.155	Ethics Electives	4 4 * *

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
26.110	Hist. Anc. Phil. Philosophy Elec. Electives	4 4 4 4 * *	26.111	Hist. Mod. Phil. Philosophy Elec. Electives	4 4 4 4 * *

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
26.118	20th Cent. Phil. Philosophy Elec. Electives	4 4 4 4 * *		Philosophy Elec. Philosophy Elec. Electives	4 4 4 4 * *

\*A total of 58 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**PHYSICS****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.201	Calculus	5 5	10.202	Calculus	5 5	10.203	Algebra	5 5
11.151	Physics	3 3	11.152	Physics	3 3	11.153	Physics	3 3
11.161	Physics Lab.	(3) 1	11.162	Physics Lab.	(3) 1	11.163	Physics Lab.	(3) 1
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
	Mod. Lang.	3 3		Mod. Lang.	3 3		Mod. Lang.	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.204	Calculus	4 4	10.205	Calculus	4 4
11.154	Physics	4 4	11.155	Physics	4 4
11.164	Physics Lab.	(3) 1	11.165	Physics Lab.	(3) 1
11.170	Surv. Cont. Physics Mod. Lang. or Elective	3 3 4 4 4 4	26.150	Intro. Logic or Phil. of Sci. Mod. Lang. or Elective	4 4 4 4 4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.251	Analysis	4 4	10.252	Analysis	4 4
11.200	Mech. I	4 4	11.201	Mech. II	4 4
11.260	Wave Lab. Sci. Elec.	2(3) 4 4 4	11.220	Therm. & Kin. Theo.	4 4
			11.261	Exp. Lab. Sci. Elec.	1(4) 3 4 4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.210	Elec. & Mag. I	3 3	10.207	Diff. Equations Electives	4 4 *
11.230	Mod. Phys.	4 4			
11.262	Elect. Lab. Electives	1(4) 3 *			

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.211	Elec. & Mag. II	4 4	11.212	Elec. & Mag. III	4 4
11.263	Mod. Phys. Lab	1(4) 3	11.241	Quantum II or Elective	4 4 4 4
11.240	Quantum I or Elective	4 4 4 *	Electives		*

\*A total of 34 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**POLITICAL SCIENCE****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Science	3 3	16.107	Earth Science	3 3	16.108	Earth Science	3 3
22.101	Intr. Pol. Sci. I	3 3	22.102	Intr. Pol. Sci. II	3 3	22.103	Intr. Pol. Sci. III	3 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
	Mod. Lang.	3 3		Mod. Lang.	3 3		Mod. Lang.	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
22.151	Comp. Govt.	4 4	22.131	Amer. Nat. Govt.	4 4
23.210	U.S. to 1865	4 4	23.211	U.S. since 1865	4 4
39.115	Prin. & Prob. Econ. Mod. Lang. or Elective	4 4 4 4 4 4 4 4	39.116	Prin. & Prob. Econ. Mod. Lang. or Elective	4 4 4 4 4 4 4 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
20.100	Prin. Soc. Anthr.	4 4	21.100	Prin. Soc. Pol. Sci. Elec.	4 4
22.221	Intern. Relations Electives	4 4 *		Electives	*

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
22.261	Public Admin. Pol. Sci. Elec. Electives	4 4 4 4 4 *		Pol. Sci. Elec. Pol. Sci. Elec. Electives	4 4 4 4 *

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
22.271	Pol. Theory Pol. Sci. Elec. Electives	4 4 4 4 4 *		Pol. Sci. Elec. Pol. Sci. Elec. Electives	4 4 4 4 *

\*A total of 50 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**PSYCHOLOGY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3					
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.			
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3	3
23.101	West. Civ.	3	3	23.102	West. Civ.	3	3	23.103	West. Civ.	3	3
30.101	English Mod. Lang.	3	3	30.102	English Mod. Lang.	3	3	30.103	English Mod. Lang.	3	3

**SECOND YEAR**

QUARTER 4			QUARTER 5				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
10.104	Math.	4	4	10.105	Math.	4	4
19.107	Gen. Psych.	4	4	19.108	Gen. Psych.	4	4
20.100	Anthropology Language or Elective	4	4	21.100	Sociology Language or Elective	4	4
		4	4			4	4

**THIRD YEAR**

QUARTER 6			QUARTER 7				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
19.120	Stat. in Psych.	4	4	19.121	Stat. in Psych.	4	4
	Biology	4	4		Biology	4	4
	Psych. Elect.	4	4		Psych. Elect.	4	4
	Elective	4	4		Elective	4	4

**FOURTH YEAR**

QUARTER 8			QUARTER 9				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
19.160	Exp. Psych. I	3(3)	4	19.161	Exp. Psych. II	3(3)	4
	Psych. Elect.	4	4		Psych. Elect.	4	4
	Electives	*	*		Electives	*	*

**FIFTH YEAR**

QUARTER 10			QUARTER 11				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
19.162	Exp. Psych. III	3(3)	4	19.211	Systems of Psych.	4	4
19.210	Hist. of Psych.	4	*		Psych. Elect.	4	4
	Electives	*			Electives	*	*

\*A total of 50 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**SOCIOLOGY AND ANTHROPOLOGY**

(with a concentration in Sociology†)

**FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Science	3    3	16.107	Earth Science	3    3	16.108	Earth Science	3    3
22.101	Intr. Pol. Sci. I	3    3	22.102	Intr. Pol. Sci. II	3    3	22.103	Intr. Pol. Sci. III	3    3
23.101	West. Civ.	3    3	23.102	West. Civ.	3    3	23.103	West. Civ.	3    3
30.101	English	3    3	30.102	English	3    3	30.103	English	3    3
	Mod. Lang.	3    3		Mod. Lang.	3    3		Mod. Lang.	3    3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
19.107	Gen. Psych. I	4    4	19.108	Gen. Psych. II	4    4
20.100	Prin. Soc. Ant.	4    4	21.100	Prin. Soc.	4    4
39.115	Prin. & Prob. Econ. Mod. Lang. or Elective	4    4	39.116	Prin. & Prob. Econ. Mod. Lang. or Elective	4    4
	4    4			4    4	

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
21.111	Amer. Society	4    4	21.241	Soc. Res. II	3(2) 4
21.239	Stat. Anal.	2(2) 4		Electives	4    4
21.240	Soc. Res. Meth.	3(2) 4		Anthr. Elective	4    4
	Elective	4    4		Electives	*

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
21.280	Soc. Theory	4    4	21.281	Soc. Theory II	4    4
	Sociology Elec.	4    4		Anthr. Elective	4    4
	Electives	*		Electives	8    8

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Sociology Elec.	4    4		Sociology Elec.	4    4
	Electives	*		Electives	*

†Students desiring more concentration in either Anthropology or Social Welfare should contact the Department Chairman for a list of these courses.

\*A total of 46 quarter hours of electives including two hours of Physical Education must be taken to meet the graduation requirements of 176 quarter hours.

**FORSYTH DENTAL PROGRAM****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
12.101	Chemistry	2(3) 3	12.102	Chemistry	2(3) 3	18.110	Microbiology	2(3) 3
18.101	Biology	2(3) 3	18.102	Biology	2(3) 3	30.103	English	3 3
30.101	English	3 3	30.102	English	3 3	DH-05	Histology	3 3
DH-01	Dental Anatomy	2 2	DH-02	Dental Anatomy	2 2	DH-13	Clin. Dent. Hyg.	(6) 2
DH-11	Clin. Dent. Hyg.	2(3) 3	DH-12	Clin. Dent. Hyg.	2(3) 3	DH-20	Radiology	2 2
			DH-40	Nutrition	2 2	DH-28	Dental Materials	2(1) 2
						DH-60	Public Health	2 2

**SECOND YEAR**

QUARTER 4			QUARTER 5			QUARTER 6		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.148	Anatomy	3(3) 4	18.103	Physiology	3(3) 4	19.102	Psychology	4 4
DH-07	Pathology	2 2	DH-15	Clin. Dent. Hyg.	*15 3	21.102	Prin. Soc. Relations	4 4
DH-14	Clin. Dent. Hyg.	*15 3	DH-23	Dental Specialties	2 2	DH-03	Dental Anatomy	2 2
DH-22	Dental Specialties	2 2	DH-30	Pharmacology	2 2	DH-16	Clin. Dent. Hyg.	*15 3
DH-61	Pub. Health	2 2	DH-70	Speech	2 2	DH-24	Dental Specialties	2 2
	Physical Ed.	**		Physical Ed.	**	DH-50	Offic Procedures	2 2
							Physical Ed.	**

DH Courses given by the Forsyth Dental School.

() Lab Hours

\* Clinic Hours

\*\* Physical Education is an elective.



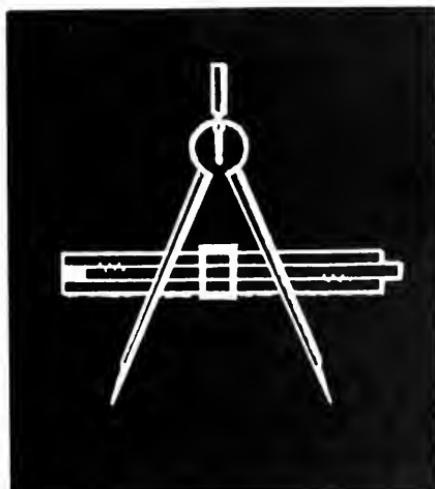
## *College of Engineering*

**William F. King, Acting Dean**

**Donald H. MacKenzie, Associate Dean**

**Otis F. Cushman, Assistant Dean**

**George W. Hankinson, Assistant Dean  
and Director of The Graduate School  
of Engineering**



### Aims

It is the purpose of the College of Engineering to provide educational programs which will effectively prepare students to become professional practitioners, to enter graduate schools, or to accept employment in the many industrial fields in which an engineering background is helpful. Principally concerned with undergraduate instruction, the College is operated on the Cooperative Plan and offers five-year curricula leading to the baccalaureate degree in civil, mechanical, electrical, chemical, industrial, and biomechanical engineering.

The academic program begins with a 36-week freshman year of full-time study during which the student continues to build the foundation in mathematics, the physical sciences, and means of expression that were begun in high school. Cooperative work in the same general field of engineering for which he is preparing begins with the second year and continues throughout the upper-class program. Thus the student has an opportunity to gain some insight into problems of actual engineering practice as he progresses through the course of study at the College.

In keeping with recent trends in engineering education, the cooperative curricula at Northeastern comprise a balanced sequence of courses in which the technological disciplines occupy about four-fifths of the student's program and the humanistic or general studies about one-fifth. These two aspects of the undergraduate curriculum are integrated throughout the entire five years so that growth in cultural understanding proceeds hand in hand with development of technical knowledge and skill. This plan, widely utilized in engineering education, is quite different from that in legal or medical education, in which the general studies precede the professional training, but it has proved to be highly effective in the preparation of engineers and industrial leaders.

### Methods

The courses of study in the first year are identical for all engineering students, and it is possible for a student to change his curriculum at the end of the freshman year without loss of time. Emphasis throughout all curricula is laid upon fundamental concepts and skills so that the student may develop an adequate foundation upon which to base his professional development. In the undergraduate programs relatively little time can be devoted to courses in specialized aspects of current engineering practice. These must in the main be given in graduate schools, where specialization is appropriate and possible.

Undergraduate curricula at Northeastern are designed to develop young men and women with well-balanced personal qualities, a sense of civic responsibility, an understanding of industrial job requirements, and a technical competence sufficient to begin a professional career. Instruction both in the classroom and in the laboratory is designed to place maximum emphasis upon individual initiative and responsibility and to develop the student's powers of analysis.

Because an engineering education teaches the students to search out the truth, to think clearly, and to formulate conclusions based upon a solid foundation of facts, engineers are being called upon more and more to occupy positions of responsibility in the management of our great industrial enterprises. Even in such diverse fields as banking, public health, and public administration, this so-called engineering approach is in demand.

Day graduate programs are available in the Departments of Chemical, Civil, Mechanical, Industrial, and Electrical Engineering, and of Mathematics, and Physics, leading to the master's degree. The former are cooperative programs in engineering similar to the undergraduate co-operative programs. In Physics, conventional two-year, half-time fellowships are available.

Doctoral programs are available in Electrical, Chemical, and Mechanical Engineering.

### **Part-Time Program Offered During Evening Hours**

The College of Engineering also offers eight-year curricula leading to the degree of Bachelor of Science in Electrical or Civil Engineering. Classes are held in the evening and Saturday mornings. Admission and course requirements are the same as for the degree under the Cooperative Plan. For further information consult the evening bulletin of the College of Engineering.

### **Power Systems Engineering**

In order to meet the needs of the rapidly expanding electric-power industry, Northeastern has initiated a special program in power systems engineering. This program is an accelerated cooperative program which results in a bachelor's degree in five years or a combined bachelor's and master's degree in six years. The subject matter is basically that of electrical engineering augmented by additional work in power systems, economics, computer control, atomic energy, and direct energy conversion.

### **Admission Requirements**

It is important that applicants for admission to the College of Engineering complete successfully the full sequence of secondary school courses in English, mathematics, and science. The following subjects are required:

<b>Subject</b>	<b>Units</b>
English (4 years)	3
Physics and Chemistry	2
Algebra (through quadratics)	2
Plane Geometry and Trigonometry	1½
Other college preparatory subjects	4½
Electives, not more than	2
	15

### **GRADUATION REQUIREMENTS**

The College of Engineering offers five-year curricula, conducted on the Co-operative Plan, leading to the following degrees:

1. Bachelor of Science in Civil Engineering
2. Bachelor of Science in Mechanical Engineering
3. Bachelor of Science in Electrical Engineering
4. Bachelor of Science in Chemical Engineering
5. Bachelor of Science in Industrial Engineering
6. Bachelor of Science in Engineering Biophysics

These curricula are described in the following pages. Final choice of curriculum for all except those enrolled in the biophysics and biomedical curriculum need not be made until the beginning of the second year.

Candidates for the Bachelor of Science degree must complete all of the pre-

scribed work of the curriculum in which they seek to qualify. A total of 195 quarter hours (equivalent to 146 semester hours) is required for the degree. Students who undertake cooperative work assignments must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive the Bachelor of Science degree until he has completed at least one academic year at Northeastern immediately preceding his graduation.

## Scholarship Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the designated field of specialization. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

## Graduation with Honor

Candidates of distinctly superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

## Engineering Curricula

A brief description of each of the five engineering curricula, together with a short statement as to the principal vocational opportunities available to graduates, is given below to assist students in choosing their fields of specialization.

**I. Civil Engineering** has to do with the planning and building of all kinds of structures and public works. None of the structures of civil engineers lend themselves to quantity production in a factory. Not only are civil engineering works designed to fit a single location, but ordinarily their value is dependent upon their ability to resist forces tending to move them.

Civil engineering is as old as civilization itself and, until recent times, it embraced all phases of engineering except those of a military character. Today its major branches include topographical, municipal, railroad, highway, structural, hydraulic, and sanitary engineering. It covers land surveying, soil mechanics, the building of railroads, harbors, docks, and similar structures; the construction of sewers, water works, streets, and highways; the design and construction of flood control projects, bridges, buildings, walls, foundations, and of all fixed structures.

Since the first step in every civil engineering project involves accurate measurement of the surface features of the land, of the nature of the soil, and of the character of the underlying rock, the study of surveying and related subjects occupies a large place in the civil engineering curriculum. And since the primary consideration in designing any structure is to make certain that it will withstand safely any force to which it may be subjected, the mechanics of static bodies, strength of materials, and theory of structures are studied in de-

tail. The curriculum is thus intended to prepare the young civil engineer to take up the work of design and construction of structures, to solve the problems of water supply and waste disposal in urban areas, and intelligently to undertake the supervision of work in allied fields of engineering and in general contracting.

Upon graduation, the young engineer may expect a period of apprenticeship either in the field, surveying and plotting, or in the office, over the drafting board. As experience is gained, the graduate is entrusted with greater responsibilities in actual design and supervision of construction. Those who prefer a roving existence should direct their ambitions toward private fields, while those who prefer a stable home and community life will seek opportunities in the public service of the Federal Government and the various states and municipalities.

**II. Mechanical Engineering** is concerned with the harnessing of power resources by means of machinery to perform useful work. With the increasing mechanization of all industry which has taken place during the last century, the field has so broadened as to include all lines of industry.

In contrast to the civil engineer, who deals primarily with static forces, the mechanical engineer is more concerned with the mechanics of motion or kinetics. And because moving parts require constant care and adjustment, the mechanical engineer has the task not only of designing and installing complicated machinery but also of operating it efficiently after it has been installed.

The construction and operation of furnaces, boilers, and engines, the design of all kinds of machinery from pocket watches to steel boring mills, the construction and operation of railway and other transportation equipment including automobiles and airplanes, and even control of atmospheric conditions by means of heating and air conditioning equipment, all fall within the field of mechanical engineering.

Since machinery is so predominantly the concern of the mechanical engineer, the program of study is designed to give the student considerable training in the principles underlying the design and operation of engines, power transmission devices, machine tools, and other machinery. This, of course, implies a thorough study of the physical laws concerning motion and transfer of energy. Applied mechanics and thermodynamics occupy a prominent place in the curriculum. The program of instruction thus gives the student a broad foundation in those fundamental subjects essential to all engineering practice and, in the senior year, provides for limited specialization.

For those students desiring to specialize in the field of industrial management, attention is called to the curriculum in industrial engineering, the basic training of which is essentially the same as that in mechanical engineering.

The graduate mechanical engineer generally finds employment in an industrial plant, either in design and research or in plant operation and maintenance. And if his abilities lie in that direction, he frequently is entrusted after a time with greater and greater responsibility for the successful management of the enterprise.

**III. Electrical Engineering** is a fast-moving field, obtaining much of its impetus from the contemporary pioneering developments in the pure sciences. For this

reason, the program of study in electrical engineering includes more work in physics and mathematics than do the other programs and provides a solid grounding in engineering fundamentals as well.

Electrical engineering today embraces a continually widening sphere of activity. It ranges in scope from laboratory and theoretical studies in applied physics to the economic design of communications and energy systems, serving not only the land-based requirements of entire continents but also the needs of space exploration.

Because electrical properties, concepts, instrumentation, and control are basic to much of modern technology, the electrical engineer is often engaged in interdisciplinary activities. Examples are biomedical electronics, electro-optics, and machine translation of languages.

The profession of electrical engineering affords a wide diversification of employment opportunities. If one is research-minded, opportunity to develop one's talents may be found in one of the great university or industrial laboratories; if one is interested in industrial applications or plant problems, opportunity can be found in the manufacturing or operating organizations; and if one is sales-minded, he may find a career as a sales engineer.

**IV. Chemical Engineering** has grown out of the discoveries in the chemical laboratories which have served as a foundation for a great many new industries whose production processes involve chemical as well as physical changes. Petroleum refining, coal carbonization, plastics, manufacture of nylon and cellophane, and hundreds of other industries require men and women trained in chemistry as well as in engineering. Moreover, much of the training received by the chemical engineer is now being applied in the rapidly developing field of nuclear engineering. Many older industries, such as foods, textiles, paints and varnishes, and leather, are also employing chemical engineers.

The chemical engineer has been defined as a "professional man experienced in the design, construction, and operation of plants in which materials undergo chemical and physical change." It is the task of the chemical engineer to reduce the costs, increase production, and improve the quality of the products in the industry.

In addition to the fundamental courses in chemistry, mathematics, and physics required of all engineering students, a considerable amount of time is devoted to more advanced work in chemistry as a foundation for the study of chemical technology. In recognition of the increasing interest in the production and utilization of nuclear energy, a course in modern physics and a course in the introduction to nuclear engineering recently have been added to the curriculum. Instruction in the elements of mechanical and electrical engineering also helps to give the student a sound engineering background. Since the field of chemical engineering is so varied, the curriculum has been designed to give the students a broad training in which fundamental principles are stressed. It is believed that this training will enable the students to acclimate themselves readily to whatever industry they may choose to enter.

Because of the complex nature of many chemical processes and because of the difficulty of translating laboratory results into full-scale plant operations, there has been developed in many chemical plants the so-called semi-works or pilot plant. Here new processes developed by the chemists in the research

laboratory are put to the test of actual plant conditions. And it is here that the young chemical engineers often find themselves upon graduation. If they are able to understand the chemist on the one side and the plant operator on the other, and if they are technically competent as well, they will soon find opportunities for advancement either in one of the technical branches of the industry, such as design, development, research, and production; or in the sales and management fields in which a knowledge of chemical engineering is essential.

**V. Industrial Engineering** is concerned with the application of engineering and scientific principles to the varied problems in the field of production management involving the intelligent utilization of men, materials, machines, and money.

About sixty years ago, Frederick W. Taylor undertook to apply to the problems of industrial management what we now call "the scientific method" or "the engineering approach." He reasoned that it was management's business to know what constituted a proper day's work and that the way to get the facts was through research and experiment on a scientific basis. He defined "scientific management" not as any device or scheme or gadget, but as a new outlook—a new viewpoint based upon a solid foundation of fact. The methods employed by Taylor and by those who came after him have undergone some modification, but the concept of scientific management which he formulated has gained wider and wider recognition from both employers and employees.

This growing recognition of the value of a scientific approach to the problems of industrial management soon created a demand for men and women trained in engineering and science, who possessed a knowledge of business as well, to assume positions of administrative responsibility in industry. To meet this demand, courses were established in many engineering colleges to provide a thorough training in engineering fundamentals, together with a specialized training in business administration which would prepare the students for managerial responsibilities in technical industries. These curricula are variously entitled industrial engineering, administrative engineering, and engineering administration, and all are designed to lead ultimately to positions of administrative or executive responsibility, rather than to positions which involve highly specialized technical engineering responsibility.

The curriculum in industrial engineering, then, provides a course of study which is essentially the same as that for mechanical engineering in the first three years. In the last two years, however, advanced engineering courses are replaced by courses in business management.

Upon graduation, the young industrial engineer may find his way into such factory staff departments as methods engineering, production planning and control, wage administration, quality control, and time study. If he prefers, he may select work in cost accounting or statistical analysis; or he may incline towards sales engineering activity and serve in the field as a sales and service representative.

More and more there is opportunity for the experienced industrial engineer to serve industry in a consulting capacity. Upon becoming especially skilled in his profession, he is called in by industry for assistance in the installation

and maintenance of sound management principles, and in the reorganization of enterprises which have failed.

**VI. Biophysics and Biomedical Engineering** is concerned with the scientific principles underlying the physical and biological sciences and their application to problems of biological significance. Research in biology and medicine for our immediate environment, for the exploration of extraterrestrial space, and for marine biology has placed very stringent requirements on the knowledge, understanding, and performance of the physical scientist engaged in these investigations. The scientific methods and techniques of the physical scientists are being applied to an increasing extent to problems in the biological sciences.

Fields of endeavor which involve bioengineers and biophysicists include:

1. Design, development, and application of instrumentation for biological studies, including electrocardiographs, radioelectrocardiographs, electron microscopes, ultra-centrifuge units, pH equipment, electrophoresis apparatus, nuclear instrumentation, specialized microscopes, and laser units.
2. Characterization of biological systems by suitable models, including models of the heart, the neuron, simulation of cardiac or respiratory action on a computer, and design and analysis of adaptive systems.
3. Contributions to the solution of basic biological problems, including cell growth, cell division, cell differentiation, carcinogenesis, interaction of radiation, both electromagnetic and particulate with living tissue, and transmission of information within the biological system, and between the biological system and its environment.
4. Application of physical systems to medical diagnosis, care, and therapy, including the application of equipment of the first group, as well as X-ray equipment, monitoring equipment in anaesthesiology, surgery and on the hospital wards, the use of computers in electrocardiographic and other data analysis, the use of electromagnetic radiation, particle radiation and ultrasonics, and maintenance of satisfactory ecological systems.
5. Investigation of biological systems to assist in understanding physical systems, including study of the flight of bats involving ultrasonic radar, the sensing systems of electric fish, the flight of birds and the infrared detection systems of reptiles.

The program of study is an honors program which includes courses in the biological sciences, the physical sciences, and the humanities. Basic courses in biology, mathematics, and physics are at the level taught to individuals majoring in these areas. The basic principles learned are applied to courses in molecular and cellular biology, human physiology, and the engineering sciences. Courses in biophysics and biomedical engineering emphasize the application of physical techniques and methods to the solution of biological problems.

During the cooperative work period, the student will be able to familiarize himself with laboratory research and development. An undergraduate thesis based on work carried out during the cooperative work period or at the University is required.

Education in biophysics and biomedical engineering provides a sound foundation for future studies toward a doctorate in medicine or dentistry, or a career as a research scientist in a university, hospital, or government agency such as the National Aeronautics and Space Administration or the Department of Health, Education, and Welfare. Industrial organizations interested in space-oriented or biomedically oriented research are also seeking individuals with qualifications in these areas. Other career opportunities include the marine sciences, the psychological sciences, and public health.

**BIOPHYSICS AND BIOMEDICAL ENGINEERING****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.111	Comp. Prog.	1 0	9.112	Comp. Prog.	1 0	7.100	Intr. to Eng. for Life Sci.	1 1
10.201	Calculus	5 5	10.202	Calculus	5 5	9.113	Comp. Prog.	1 1
11.151	Physics	3 3	11.152	Physics	3 3	10.203	Algebra	5 5
12.131	Chemistry	3(3) 4	12.132	Chemistry	3(3) 4	11.153	Physics	3 3
18.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	12.133	Chemistry	3(3) 4
30.101	English	3 3	30.102	English	3 3	18.113	Gen. Biol.	2(3) 3
90.100	Intr. Eng.	1 0	90.101	Intr. Eng.	1 1	30.103	English	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.111	Circuit Th. I	3 3	3.112	Circuit Th. II	3 3
10.204	Calculus	4 4	10.205	Calculus	4 4
11.110	Physics Lab.	(3) 1	11.111	Physics Lab.	(3) 1
11.154	Physics	4 4	11.155	Physics	4 4
12.147	Org. Chem.	4(3) 5	12.148	Org. Chem.	4(3) 5
39.125	Economics	3 3	39.126	Economics	3 3

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.113	Circuit Th. III	3 3	2.141	Mat'l Sci. (with biomed. appl.)	3(4) 5
3.131	E.E. Lab.	(3) 1	3.121	Sigs. & Sys.	3 3
10.146	Math. Anal.	3 3	3.141	Electronics	3 3
11.140	Solid St. Elect.	3 3	10.147	Math. Anal.	3 3
73.234	Biochemistry	4(3) 5	11.220	Thermodyn. & Kin. Th.	4 4
	Liberal Elective	3 3		Liberal Elective	3 3

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.122	Sigs. & Sys. II	3 3	3.132	E.E. Lab. II	(3) 3
3.142	Electronics II	3 3	3.143	Electronics III	3 3
4.111	Chem. Eng.		4.112	Chem. Eng. Sci. II	3 3
	Sci. I or	3 3		or	
11.210	Elec. & Mag.	3 3	10.208	Probability	4 4
18.258	Cell Physiol.	3(3) 4	18.259	Cell Physiol.	3(3) 4
	Biophysics	3 3*		Biophysics	3 3*
	Intr. to Bioeng.	1 1*		Intr. to Bioeng.	1 1*
	Liberal Elective	3 3		Liberal Elective	3 3

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
4.113	Chem. Eng. Sci. III or	4 4	10.208	Probability or	4 4
11.211	Elec. & Mag.	4 4	11.212	Elec. & Mag.	4 4
11.230	Mod. Physics	4 4	11.240	Quantum I	4 4
	E.E. Lab. (special)	(3) 2		Liberal Elective	3 3
	Human Physiol.	3 3*		Human Physiol.	3 3*
	Bioengineering &	*		Bioengineering &	*
	BioPhysics Lab.	(3) 2		Biophysics Lab.	(3) 2
	Bioengineering Thesis	3 3*		Bioengineering Thesis	3 (3) 3
		(3) 3			

\*Courses not presently offered at the University.  
See page 134 for Liberal Electives.

**CHEMICAL ENGINEERING****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.101	Graphic Sci.	3(2) 4	9.102	Graphic Sci.	2(2) 3	4.100	Intr. Chem. Eng.	1 1
0.141	Calculus	4 4	10.142	Calculus	4 4	9.103	Graphic Sci.	2(2) 3
1.101	Physics	3 3	11.102	Physics	3 3	10.143	Calculus	4 4
2.111	Gen. Chem.	3 3	12.112	Gen. Chem.	3 3	11.103	Physics	3 3
0.101	English	3 3	30.102	English	3 3	12.116	Gen. Chem.	3(3) 4
0.100	Intr. Eng.	1 0	90.101	Intr. Eng.	1 1	30.103	English	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
4.101	Chem. Eng. Calc. I	3(3) 4	4.102	Chem. Eng. Calc. II	3 3
10.144	Calculus	4 4	4.104	Com. Chem. Dev.	3 3
11.104	Physics	3 3	10.145	Calculus	4 4
11.110	Physics Lab.	(3) 1	11.105	Physics	3 3
12.147	Org. Chemistry	4(3) 5	11.111	Physics Lab.	(3) 1
			12.148	Org. Chemistry	4(3) 5

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.115	Mechanics A	4 4	2.118	Mechanics D	4 4
4.111	Chem. Eng. I	3 3	4.112	Chem. Eng. II	3 3
10.146	Math. Analysis	3 3	10.147	Math. Analysis	3 3
12.161	Phys. Chemistry	4(3) 5	12.162	Phys. Chemistry	4(3) 5
	Liberal Elective	3 3		Liberal Elective	3 3

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
4.121	Chem. Eng. III	4 4	4.122	Chem. Eng. IV	4 4
4.125	Materials Sci.	4 4	4.124	Exp. Methods II	2(4) 4
4.123	Exp. Methods I	2(4) 4	4.126	Chem. Eng. Thermo.	4 4
39.125	Economics	3 3	39.126	Economics	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.181	Elect. Eng. I	3 3	3.182	Elect. Eng. II	3 3
4.131	Process Design or	1(6) 7	4.132	Process Design or	1(6) 7
4.133	Projects	1(6) 7	4.134	Projects	1(6) 7
4.135	Intr. Nuclear Eng.	4 4	4.136	Chem. Eng. Kin.	4 4
29.102	Efec. Speaking	3 3		Liberal Elective	3 3
90.252	Prof. Develop.	2 1			

See page 134 for Liberal Electives.

**CIVIL ENGINEERING****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.101	Graphic Sci.	3(2) 4	9.102	Graphic Sci.	2(2) 3	1.100	Intr. Civ. Eng.	1 1
10.141	Calculus	4 4	10.142	Calculus	4 4	9.103	Graphic Sci.	2(2) 3
11.101	Physics	3 3	11.102	Physics	3 3	10.143	Calculus	4 4
12.111	Gen. Chem.	3 3	12.112	Gen. Chem.	3 3	11.103	Physics	3 3
30.101	English	3 3	30.102	English	3 3	12.113	Gen. Chem.	3 3
90.100	Intr. Eng.	1 0	90.101	Intr. Eng.	1 1	30.103	English	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
1.110	Surveying I	3(3) 4	1.140	Struct. Mech. I	4 4
3.181	Elec. Eng. I	3 3	3.182	Elec. Eng. II	3 3
10.144	Calculus	4 4	10.145	Calculus	4 4
11.104	Physics	3 3	11.105	Physics	3 3
11.110	Physics Lab.	(3) 1	11.111	Physics Lab.	(3) 1
39.125	Economics	3 3	39.126	Economics	3 3

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
1.111	Surveying II	4(3) 5	1.120	Fluid Mech. I	4 4
1.141	Struct. Mech. II	4 4	1.180	Materials	4 4
2.120	Thermodyn.	3 3	2.116	Mechanics B	4 4
10.146	Math. Analysis	3 3	10.147	Math. Analysis	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
1.121	Fluid Mech. II	3 3	1.143	Struct. Anal. I	4 4
1.142	Struct. Mech. III	4 4	1.150	Conc. Design I	4 4
1.181	Conc. Test. Lab.	1(4) 4	1.172	Soil Mech.	3(3) 4
16.170	Geology	4 4	5.265	Fund. of Eng. Econ.	3 2
	Liberal Elective	3 3		Liberal Elective	3 3

**FIFTH YEAR**

QUARTER 10			QUARTER 11 (Struct. Option)			QUARTER 11 (San. Eng. Option)		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
1.144	Struct. Anal. II	3 3	1.130	Hwy. & Cons. Eng.	4 4	1.130	Hwy. & Cons. Eng.	4 4
1.151	Conc. Design II	3 3	1.145	Struct. Anal. III	3 3	1.191	San. Eng. II	4 4
1.160	Struct. Design I	4 4	1.161	Struct. Design II	3(3) 4	1.192	San. Eng. III	3(3) 4
1.190	San. Eng. I	4 4	1.191	San. Eng. II	4 4	5.146	Basic Eng. Stat.	3 3
29.102	Effec. Speaking	3 3		Liberal Elective	3 3		Liberal Elective	3 3
90.252	Prof. Develop.	2 1						

## INDUSTRIAL ENGINEERING

## FIRST YEAR

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
1.101	Graphic Sci.	3(2) 4	9.102	Graphic Sci.	2(2) 3	5.100	Intr. Ind. Eng.	1 1
1.141	Calculus	4 4	10.142	Calculus	4 4	9.103	Graphic Sci.	2(2) 3
1.101	Physics	3 3	11.102	Physics	3 3	10.143	Calculus	4 4
1.111	Gen. Chem.	3 3	12.112	Gen. Chem.	3 3	11.103	Physics	3 3
1.101	English	3 3	30.102	English	3 3	12.113	Gen. Chem.	3 3
1.100	Intr. Eng.	1 0	90.101	Intr. Eng.	1 1	30.103	English	3 3

## SECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
5.120	Work Design I	2(3) 3	5.121	Work Design II	2(3) 3
5.260	Eng. Economy	4 4	5.140	Intr. Probability	4 4
10.144	Calculus	4 4	10.145	Calculus	4 4
11.104	Physics	3 3	11.105	Physics	3 3
11.110	Physics Lab.	(3) 1	11.111	Physics Lab.	(3) 1
39.125	Economics	3 3	39.126	Economics	3 3

## THIRD YEAR

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.115	Mechanics A	4 4	2.119	Mechanics E	4 4
5.122	Flow Processes	2 2	5.123	Systs. & Comp.	2 2
5.141	Stat. Inference	3 3	5.142	Rel. & Qual. Cont.	2(3) 3
10.146	Math. Analysis	3 3	10.147	Math. Analysis	3 3
41.201	Intr. to Acctg.	3 3	41.202	Cost Accounting	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

## FOURTH YEAR

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.140	Mat. & Metall.	2(3) 3	2.120	Thermodyn.	3 3
3.181	Elec. Eng. I	3 3	3.182	Elec. Eng. II	3 3
5.143	Designs of Exper.	3 3	5.124	Manufac. Proc.	2(3) 3
5.161	Operations Res. I	4 4	5.125	Prod. Eval. & Value Anal.	2(2) 3
5.180	Mgmt. Inform. Sys.	2 2	5.162	Prod. & Invent. Control	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

## FIFTH YEAR

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
5.163	Operation Res. II	3 3	5.164	Plant Layout & Design	2(3) 3
5.181	Personnel & Motivat.	3 3	5.184	Ind. & Labor Rel.	3 3
5.182	Quant. Dist. Sys.	3 3	5.185	Senior Seminar Ind. Eng. Elective	3 3
5.183	Organizations	2 2		Eng. Elective	3 3
29.102	Public Speaking or Special Project	3 3		Liberal Elective	3 3
	Placement Tech.	1 1			

See page 134 for Liberal Electives.

**MECHANICAL ENGINEERING****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.101	Graphic Sci.	3(2) 4	9.102	Graphic Sci.	2(2) 3	2.100	Intr. Mech. Eng.	1
10.141	Calculus	4 4	10.142	Calculus	4 4	9.103	Graphic Sci.	2(2)
11.101	Physics	3 3	11.102	Physics	3 3	10.143	Calculus	4
12.111	Gen. Chem.	3 3	12.112	Gen. Chem.	3 3	11.103	Physics	3
30.101	English	3 3	30.102	English	3 3	12.113	Gen. Chem.	3
90.100	Intr. Eng.	1 0	90.101	Intr. Eng.	1 1	30.103	English	3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.101	Mechanics I	4 4	2.102	Mechanics II	4 4
3.181	Elec. Eng. I	3 3	3.182	Elec. Eng. II	3 3
10.144	Calculus	4 4	10.145	Calculus	4 4
11.104	Physics	3 3	11.105	Physics	3 3
11.110	Physics Lab.	(3) 1	11.111	Physics Lab.	(3) 1
39.125	Economics	3 3	39.126	Economics	3 3

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.103	Mechanics III	4 4	2.104	Mechanics IV	4 4
2.121	Termodyn. I	4 4	2.122	Thermodyn. II	4 4
2.160	M.E. Lab. I	2(3) 4	2.141	Material Sci.	3(3) 4
10.146	Math. Analysis	3 3	10.147	Math. Analysis	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
1.148	Structures	3 3	2.106	Fluid Mech. II	4 4
2.105	Fluid Mech. I	3 3	2.124	Heat Transfer	4 4
2.123	Applied Thermo.	4 4	2.161	M.E. Lab. II	(4) 3
2.142	Materials & Pro.	4(2) 5	5.245	Stat. & Probability	4 4
	Liberal Elective	3 3		Liberal Elective	3 3

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.107	Vibration & Cont.	4 4	2.109	Machine Design	4 4
2.108	Design Fund.	4 4	2.126	Thermodyn. III or	4 4
2.125	Nuclear Eng.	3(2) 4	2.214	Exper. Stress Anal.	4 4
2.162	M.E. Lab. III	(4) 3	2.127	Direct Eng. Conv. or	4 4
29.102	Eff. Speaking	3 3	2.232	Phys. Metallurgy	4 4
90.252	Prof. Develop.	2 1	5.144	Quality Control or	3 3
			5.184	Ind. & Labor Rel. or	3 3
			5.265	Eng. Economy Liberal Elective	3 3

SIX-YEAR OPTION (continued on following page)

See page 134 for Liberal Electives.

**MECHANICAL ENGINEERING****SIX-YEAR OPTION (continued)**

QUARTER 10		
No.	Course	Cl. Q.H.
2.108	Design. Fund.	4 4
2.125	Nuclear Eng.	3(2) 4
2.801	Continuum Mech.	2 2
2.862	Systems	4 4
10.806	Grad. Math.	4 4
29.102	Eff. Speaking	3 3
90.252	Prof. Develop.	2 1

QUARTER 11		
No.	Course	Cl. Q.H.
2.109	Machine Design	4 4
2.126	Thermodyn. III or	4 4
2.127	Direct Energy Conv.	4 4
2.214	Exp. Stress Anal. or	4 4
2.232	Phys. Metallurgy or	4 4
2.903	Adv. Thermodyn.	4 4
2.990	Seminar	1 1
2.802	Continuum Mech.	2 2
5.144	Quality Control or	3 3
5.265	Eng. Economy or	3 3
5.184	Ind. & Labor Rel. Liberal Elective	3 3

QUARTER 12		
No.	Course	Cl. Q.H.
2.991	3 Electives Thesis	12 12 5

QUARTER 13		
No.	Course	Cl. Q.H.
2.990	3 Electives Seminar	12 12 1 1
2.991	Thesis	5

**ELECTRICAL ENGINEERING****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.101	Graphic Sci.	3(2) 4	9.102	Graphic Sci.	2(2) 3	3.100	Intr. Elec. Eng.	1 1
10.141	Calculus	4 4	10.142	Calculus	4 4	9.103	Graphic Sci.	2(2) 3
11.101	Physics	3 3	11.102	Physics	3 3	10.143	Calculus	4 4
12.111	Gen. Chem.	3 3	12.112	Gen. Chem.	3 3	11.103	Physics	3 3
30.101	English	3 3	30.102	English	3 3	12.113	Gen. Chem.	3 3
90.100	Intr. Eng.	1 0	90.101	Intr. Eng.	1 1	30.103	English	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.101	Mechanics I	4 4	2.102	Mechanics II	4 4
3.111	Circuit Th. I	3 3	3.112	Circuit Th. II	3 3
10.144	Calculus	4 4	10.145	Calculus	4 4
11.104	Physics	3 3	11.105	Physics	3 3
11.110	Physics Lab.	(3) 1	11.111	Physics Lab.	(3) 1
39.125	Economics	3 3	39.126	Economics	3 3

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.117	Mechanics C	3 3	2.120	Thermodyn.	3 3
3.113	Circuit Th. III	3 3	3.121	Sigs. & Sys. I	3 3
3.131	E.E. Lab. I	(3) 3	3.132	E.E. Lab. II	(3) 3
10.146	Math. Analysis	3 3	3.141	Electronics I	3 3
11.140	Solid St. Elect.	3 3	10.147	Math. Analysis	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.122	Sigs. & Sys. II	3 3	3.114	Circ. & Waves	3 3
3.133	E.E. Lab. III	(3) 3	3.134	E.E. Lab. IV	(3) 3
3.142	Electronics II	3 3	3.143	Electronics III	3 3
3.161	Field Theory I	3 3	3.162	Field Theory II	3 3
5.265	Eng. Economics	3 3	3.171	Energy Conv. I	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.123	Control Sys.	3 3	1.126	Fluid Mechs.	3 3
3.135	E.E. Lab. V	(3) 3	3.136	E.E. Lab. VI	(3) 3
3.151	Comm. Theory	3 3	3.173	Energy Conv. III	3 3
3.163	Field Th. III	3 3	29.102	Efec. Speaking	3 3
3.172	Energy Conv. II	3 3		Liberal Elective	3 3
	E.E. Elective	3 3*		E.E. Elective	3 3**
90.251	Placement Tech. I	1			

\*3.221, 3.292, ord 2.143.

\*\*3.215, 3.222, 3.241, 3.291, or 3.293.  
See page 134 for Liberal Electives.

# ELECTRICAL ENGINEERING

## POWER SYSTEMS

**IRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
9.101	Graphic Sci.	3(2) 4	9.102	Graphic Sci.	2(2) 3	3.100	Intr. Elec. Eng.	1 1
0.141	Calculus	4 4	10.142	Calculus	4 4	9.103	Graphic Sci.	2(2) 3
1.101	Physics	3 3	11.102	Physics	3 3	10.143	Calculus	4 4
2.111	Gen. Chem.	3 3	12.112	Gen. Chem.	3 3	11.103	Physics	3 3
0.101	English	3 3	30.102	English	3 3	12.113	Gen. Chem.	3 3
0.100	Intr. Eng.	1 0	90.101	Intr. Eng.	1 1	30.103	English	3 3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.101	Mechanics I	4 4	2.102	Mechanics II	4 4
3.111	Circuit Th. I	3 3	3.112	Circuit Th. II	3 3
10.144	Calculus	4 4	10.145	Calculus	4 4
11.104	Physics	3 3	11.105	Physics	3 3
11.110	Physics Lab.	(3) 1	11.111	Physics Lab.	(3) 1
39.125	Economics	3 3	39.126	Economics	3 3

**HIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.117	Mechanics C	3 3	2.120	Thermodyn.	3 3
3.113	Circuit Th. III	3 3	3.121	Sigs. & Sys. I	3 3
3.131	E.E. Lab. I	(3) 3	3.132	E.E. Lab. II	(3) 3
10.146	Math. Analysis	3 3	3.141	Electronics I	3 3
11.140	Solid St. Elect.	3 3	10.147	Math. Analysis	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.128	Thermo-dynamics	3 3	3.114	Circ. & Waves	3 3
3.122	Sigs. & Sys. II	3 3	3.143	Electronics III	3 3
3.133	E.E. Lab. III	(3) 3	3.162	Field Theory II	3 3
3.142	Electronics II	3 3	3.171	Energy Conv. I	3 3
3.161	Field Theory I	3 3	3.234	E.E. Lab.	(3) 3
5.265	Eng. Economics	3 3	10.831	Probability	2 2*
	Liberal Elective	3 3		Liberal Elective	3 3

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
3.123	Control Systems	3 3	1.126	Fluid Mechanics	3 3
3.172	Energy Conv. II	3 3	3.173	Energy Conv. III	3 3
3.221	Elect. Energy Systems & Sources I	3 3	3.222	Elect. Energy Systems & Sources II	3 3
3.235	E.E. Lab.	(3) 3	3.236	E.E. Lab.	(3) 3
10.806	Advanced Math.	4 4*		Nuclear Eng.	3 3
	Liberal Elective	3 3		Liberal Elective	3 3

\*Graduate Course.  
See page 134 for Liberal Electives.

**ELECTRICAL ENGINEERING POWER SYSTEMS (continued)****SIXTH YEAR**

QUARTER 12			QUARTER 13		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
	Thesis Elective	4		Thesis Elective	4
	Power Sys. Plan.	4		Direct Energy	4*
	Anal. Ind.			Conv.	4
	Enterprise	4		Seminar II	2
	Seminar I	2		Elective	4
	Elective	4		Elective	4

\*Graduate Course.

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**LIBERAL ARTS ELECTIVES AVAILABLE TO ENGINEERING STUDENTS IN QUARTERS 6 THROUGH 11**

(Students Select One Field from Each Unit of Quarters)

**QUARTERS 6 and 7**

26.140; 26.141 Philosophy  
 27.171; 27.172 Art  
 28.110; 28.111 Music  
 29.125; 29.126 Drama  
 30.150; 30.153 English  
 31.165; 31.166 French  
 33.165; 33.166 German  
 34.165; 34.166 Russian

**QUARTERS 8 and 9**

19.103; 19.104 Psychology  
 21.107; 21.108 Sociology  
 22.115; 22.117 Political Science  
 23.190; 23.191 History

**QUARTER 10 (except Electrical)**

29.102 Effective Speaking

**QUARTER 11**

30.145 Masterpieces of Literature  
 90.201 Great Issues in Social Science



## *College of Business Administration*

**Dr. James S. Hekimian, Dean**

**Dr. Daniel J. McCarthy, Associate Dean  
and Director of The Graduate  
School of Business Administration**

**Joseph M. Golemme, Director of The  
Graduate School of  
Professional Accounting**



## Policy

The College of Business Administration offers programs of study to meet the needs of young men and women who are preparing for future business, industrial, and civic leadership and who seek to acquire professional competence in fields of their own choosing.

The first objective imposes the obligation upon the program of study to illuminate for the student the society in which he lives, the culture to which he is heir and trustee, and the challenges posed for himself and his country.

The second objective imposes the obligation to impart the nature of the professional obligation, the role of the professional in society, and the fundamental skills whose proper use justifies the title "professional."

To accomplish these objectives the programs of study assimilate principles of modern business management and administration and integrate these with courses in the liberal arts—English (literature, writing and speaking), history, and philosophy, and the social sciences, all of which are integral and essential components of each curriculum. In addition, fundamental skills and tool subjects are dealt with in their relations to the broader context of the business firm, its role, its responsibility, and its problems.

The academic content of the different curricula in the College of Business Administration is divided roughly as follows: one quarter in liberal arts other than the social sciences, one quarter in the social sciences, one quarter in a special branch of business, and one quarter in related business subjects. Since periods of probation and apprenticeship are inherent in the nature of positions at the administrative level, the Northeastern programs based on the Co-operative Plan of Education are especially significant.

## Aims

In keeping with the current trends in collegiate education, the educational policy of the College has the following aims:

First: To develop attitudes and ideals that are ethically sound and socially desirable.

Second: To develop the habits of accurate thinking that are essential to sound judgment.

Third: To provide a thorough knowledge of fundamental economic laws and an appreciation of the cultural and social foundations of western civilization.

Fourth: To build breadth of perspective and provide sufficient specialization to meet basic professional requirements.

Fifth: To offer a college program which will help students select the field of business activity best suited to their aptitudes. The Co-operative Plan is particularly effective in this respect.

## Methods of Instruction

In the accomplishment of these aims, the College makes use of the lecture and recitation systems and the problem and case methods of instruction.

Introductory and basic tool courses are, for the most part, presented on a lecture-problem basis. A large proportion of the classwork of the upper-class years consists of discussion, analysis, and reports on specific business problems and cases.

Students are encouraged to analyze propositions, to challenge unsupported assertions, to think independently, and to support their thinking with logic and facts. Frequent verbal and written reports are required.

## Admission Requirements

Applicants to the College of Business Administration must be graduates of college preparatory programs of study. The following subjects are prescribed as entrance requirements:

Subject	Units
English (4 years)	3
Mathematics	2
Science	1
Other college preparatory subjects	7
Electives, not more than	2
	<hr/>
	15

## GRADUATION REQUIREMENTS

Students may qualify for the degree of Bachelor of Science in Business Administration in one of the following areas of concentration: accounting, finance and insurance, industrial relations, management, and marketing.

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum in which they seek to qualify. Students who undertake cooperative work assignments must also meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

The final three quarters immediately preceding graduation must be completed in residence at Northeastern.

## Scholarship Requirements

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the designated area of concentration. An over-all average grade of C is required for graduation.

## Graduation with Honor

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

# THE PROGRAMS OF STUDY

## First Year

The 36 weeks of the freshman year are primarily devoted to a survey of the economic and social institutions that underlie the conduct of business. In addition, accounting and English are given important positions in the program of this first year because of their fundamental significance as tools of communication for the businessman.

Other courses are provided to enrich the student's background in such fields as the physical sciences and the cultural foundations of our civilization.

In addition to regularly scheduled orientation meetings with the Dean of Freshmen, throughout the freshman year each student has the friendly counsel and guidance of a faculty adviser whose aim is to help bridge the gap between high school and college.

## Upper-Class Years

Under the Northeastern five-year Cooperative Plan, the alternation of work and classroom study starts with the second year. During this year all students continue with a common program, a major portion of which is devoted to courses which are introductory to the functional areas of business operation.

At the end of the second year, at the close of Quarter 5, students formally elect their areas of concentration in accordance with their individual interests and aptitudes. To help make this choice a student may obtain professional advice in Northeastern's Counseling and Testing Center.

During the remaining three years, specific required courses are taken in the area of concentration elected by each student in addition to a common core of course work in the liberal arts and general business.

## Areas of Concentration

Students are required to select an area of concentration before the end of their sophomore year. A brief statement of the nature of the vocational opportunities in the various fields is presented below. It is well for the prospective student to observe that employment after graduation and success in the business world are seldom determined solely by the student's chosen area of concentration.

**I. Accounting** — Accounting is the second largest field of professional employment. Accountants may specialize in such areas as auditing, tax work, cost accounting, budgeting and control, systems and procedures, agents, investigations, bank examiners, and management services.

Leaders of institutions — business commerce and industry; state, local and national governments; bureaus and agencies; schools, churches, hospitals and foundations — all rely on data accumulated and prepared by accountants when making decisions which vitally affect the destinies of their institutions. New techniques such as electronic data processing machines are being used for the more effective collection and use of accounting data.

**II. Finance and Insurance** — Students interested in careers in the areas of security analysis, estate planning, corporate finance and control, security or insurance brokerage, underwriting, credit, banking, etc., select the finance and insurance area. There is a wide variety of vocational opportunities in business, financial institutions, and government agencies.

**III. Industrial Relations** — Opportunities exist in the field of labor-management relations for those who are qualified. Both unions and management offer positions in personnel, bargaining, wage administration, and public relations. The Government, too, has openings for men and women who are trained in this field.

**IV. Management** — This area of concentration appeals to the student who is more interested in preparation for general business administration and operation rather than any of the more specialized areas of concentration. Positions are available to graduates of this program in commercial, manufacturing, and service businesses. Production planning and control, industrial purchasing and sales, cost control, methods analysis, time study, industrial safety, personnel management, self-employment, and many other vocational opportunities are available.

**V. Marketing** — In addition to being a trained specialist in his own area of increasing opportunity and responsibility, the marketing executive must of necessity take a broad view of all aspects of business management.

With marketing, advertising, and sales success so vital to every company, opportunities for careers in marketing exist in every type of business and industry — large or small — in manufacturing and wholesaling as well as retailing; in both consumer and industrial products; in advertising departments, agencies, and media; in sales, research, marketing management, merchandising, and promotion.

## FRESHMAN AND SOPHOMORE YEARS IN THE COLLEGE OF BUSINESS ADMINISTRATION

**FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.106	Earth Science	3    3	16.107	Earth Science	3    3	16.108	Earth Science	3    3
27.101	Found. West. Cul.	3    3	27.102	Found. West. Cul.	3    3	27.103	Found. West. Cul.	3    3
30.101	English	3    3	30.102	English	3    3	30.103	English	3    3
39.101	Intr. Ec. Res.	3    3	39.102	Intr. Ec. Growth	3    3	39.103	Intr. Ec. Inst.	3    3
41.111	Prin. of Acctg.	4    3	41.112	Prin. of Acctg.	4    3	41.113	Prin. of Acctg.	4    3

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.104	Fund. Math. or	4    4	10.105	Fund. Math. or	4    4
19.105	Found. Psych.	4    4	19.106	Found. Psych.	4    4
39.105	Prin. Econ.	3    3	39.106	Prin. Econ.	3    3
43.120	Mktg. Fund.	3    3	43.121	Mktg. Dynamics	3    3
44.120	Intr. to Finance	3    3	44.121	Intr. to Finance	3    3
45.120	Intr. to Org. & Mgt.	3    3	45.121	Intr. to Pers. & Prod.	3    3

**UPPER-CLASS PROGRAMS IN ACCOUNTING****THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
41.251	Inter. Acctg.	3    3	41.252	Inter. Acctg.	3    3
41.253	Cost Acctg.	3    3	41.254	Cost Acctg.	3    3
44.150	Corp. Fin.	3    3	44.152	Corp. Fin.	3    3
49.250	Statistics	4    4	49.251	Statistics	4    4
	Elective	4    4		Elective	4    4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
41.255	Adv. Acctg.	4    4	41.256	Adv. Acctg.	4    4
49.258	Acctg. Systems	4    4	41.257	Auditing	4    4
	Elective	4    4	49.155	Legal Asp. Bus.	4    4
	Elective	4    4		Elective	4    4

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
41.259	Seminar	4    4	41.260	Taxes	4    4
41.261	Role of Acctg. in Dec. Making	4    4		Elective	4    4
49.210	Law of Bus. Organ.	4    4		Elective	4    4
90.251	Place. Tech.	1    1		Elective	4    4*
	Elective	4    4*			

\*May be dropped by ROTC students.

**UPPER-CLASS BUSINESS ECONOMICS****THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
39.250	Statistics	4 4	39.251	Statistics	4 4
39.255	Microec. Theory	4 4	39.256	Macroecc. Theory	4 4
44.150	Corp. Finance	3 3	44.152	Corp. Finance	3 3
10.104	Fund. Math. or 19.105 Found. Psych.	4 4	10.105	Fund. Math. or 19.106 Found. Psych.	4 4

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**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
45.209	Org. Beh.	4 4	49.206	Info. Syst.	3 3
49.155	Leg. Asp. Bus. Ec. Elective	4 4		Ec. Elective	4 4
	Elective	4 4		Electives	8 8

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**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
45.255	Per. Mgt.	4 4	45.256	Ind. Rel.	4 4
90.251	Placement Tech.	1 1		Ec. Elective	4 4
	Ec. Elective	4 4		Elective	4 4
	Ec. Elective	4 4*		Elective	4 4*
	B.A. Seminars				

\*May be dropped by ROTC students.

**UPPER-CLASS FINANCE AND INSURANCE****THIRD YEAR**

QUARTER 6				QUARTER 7			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
44.152	Corp. Finance	3	3	44.152	Corp. Finance	3	3
49.206	Info. System	3	3	44.250	Life Insurance	4	4
49.206	Statistics	4	4	49.251	Statistics	4	4
	Electives	8	8		Elective	4	4

**FOURTH YEAR**

QUARTER 8				QUARTER 9			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
44.252	Prop. Ins.	4	4	44.275	Money & Cap. Mkts.	4	4
44.270	Investments	4	4	49.155	Leg. Asp. Bus.	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4

**FIFTH YEAR**

QUARTER 10				QUARTER 11			
No.	Course	Cl.	Q.H.	No.	Course	Cl.	Q.H.
44.260	Fin. Forecasting	4	4	44.272	Security Anal.	4	4
44.280	Seminar F. & I.	4	4	44.281	Seminar F. & I.	4	4
	Elective	4	4		Elective	4	4
	Elective	4	4		Elective	4	4*

\*May be dropped by ROTC students.

**UPPER-CLASS MANAGEMENT****THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
41.205	Cost Acctg. or 44.155 Corp. Finance	3 3	41.205	Cost Acctg. or 44.155 Corp. Finance	3 3
49.206	Info. Systems or 19.240 Ind. Psychology	3 3	49.206	Info. Systems or 19.240 Ind. Psychology	3 3
49.205	Data Processing or 45.209 Org. Behavior	3 3	49.205	Data Processing or 45.209 Org. Behavior	3 3
49.250	Statistics Elective	4 4	49.251	Statistics Elective	4 4

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**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
45.255	Personnel Mgt.	4 4	45.256	Industrial Rel.	4 4
45.265	Produc. Mgmt.	4 4	45.266	Produc. Mgmt.	4 4
49.155	Legal Asp. Bus. Elective	4 4	Elective	4 4	4 4

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**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
45.270	Senior Seminar	4 4	45.271	Seminar in Mgmt.	4 4
49.210	Law Bus. Org.	4 4	Electives	8 8	8 8
90.251	Placement Tech. Elective	1 1 4 4	Elective	4 4*	4 4*

\*May be dropped by ROTC students.

**UPPER-CLASS INDUSTRIAL RELATIONS****THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
41.205	Cost Accounting or	3 3	41.205	Cost Accounting or	3 3
44.155	Corp. Finance	3 3	44.155	Corp. Finance	3 3
49.206	Info. Systems or	3 3	49.206	Info. Systems or	3 3
19.240	Ind. Psychology	3 3	19.240	Ind. Psychology	3 3
49.205	Data Processing or	3 3	49.205	Data Processing or	3 3
45.209	Org. Behavior	3 3	45.209	Org. Behavior	3 3
49.250	Statistics Elective	4 4	49.251	Statistics Elective	4 4
		4 4			4 4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
45.255	Personnel Mgmt.	4 4	45.256	Indus. Rel.	4 4
45.265	Produc. Mgmt.	4 4	45.266	Produc. Mgmt.	4 4
49.155	Legal Asp. Bus. Elective	4 4	Elective	4 4	4*
		4 4	Elective	4 4	4*

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
45.270	Senior Seminar	4 4	45.276	Seminar Coll.	
45.275	Labor Law	4 4	Barg.	4 4	
90.251	Placement Tech.	1 1	Elective	8 8	
	Elective	4 4	Elective	4 4	
	Elective	4 4*			

\*May be dropped by ROTC students.

**UPPER-CLASS MARKETING****THIRD YEAR**

QUARTER 6			QUARTER 7				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
43.230	Mktg. Oper. I	3	3	41.209	Distrib. Cost	3	3
43.253	Adv. Tech.	3	3	43.231	Mktg. Oper. II	3	3
44.155	Corp. Finance	3	3	43.263	Retail Mgt.	3	3
49.250	Statistics	4	4	or			
	Elective	4	4	49.206	Elective	4	4
				49.263	Info. Systems	3	3
				49.251	Statistics	4	4

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**FOURTH YEAR**

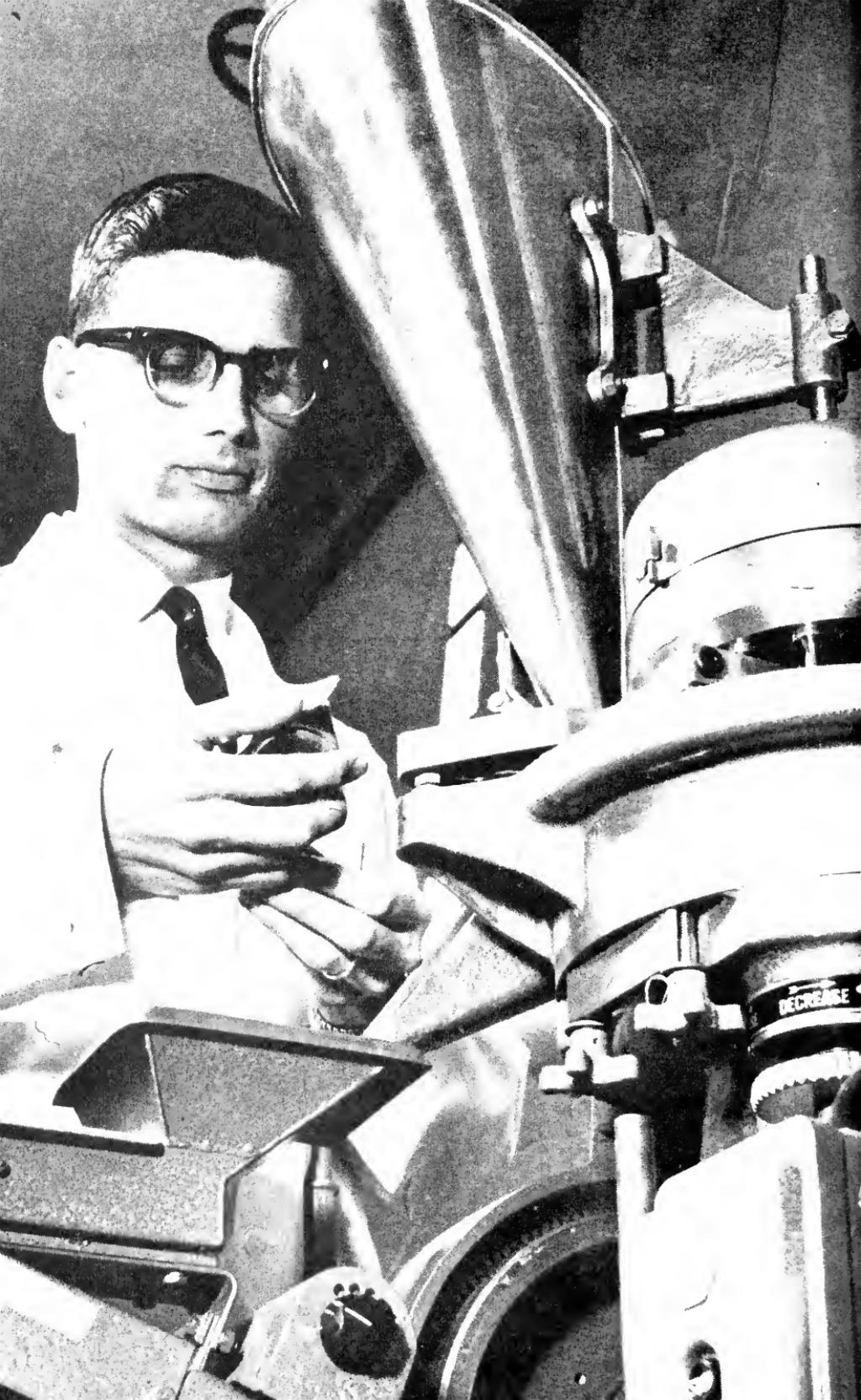
QUARTER 8			QUARTER 9				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
43.240	Mktg. Res. I	4	4	43.241	Mktg. Res. II	4	4
43.242	Sales Mgt.	4	4	43.262	Advt. Mgt.	4	4
49.155	Legal Asp. Bus.	4	4	43.263	Retail Mgt.	3	3
	Elective	4	4	Elective		4	4

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**FIFTH YEAR**

QUARTER 10			QUARTER 11				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
43.250	Mktg. Mgt. I	4	4	43.251	Mktg. Mgt. II	4	4
43.260	Ind. Mktg.	4	4	43.261	Internat'l Mktg.	4	4
	or			or			
	Elective	4	4	43.271	Elective	4	4
43.270	Mkt. Pol. Sem.	4	4	43.271	Mktg. Theory	4	4
90.251	Placement Tech.	1	1		Sem.	4	4
	Elective	4	4*	Elective		4	4*

\*May be dropped by ROTC students.





## ***College of Pharmacy***

**Dr. LeRoy C. Keagle, Dean**

**Dr. Russell E. Brillhart, Assistant Dean**

**Dr. Bernard J. Brent, Director of  
The Graduate School of Pharmaceutical Sciences**



## Aims

NORTHEASTERN UNIVERSITY recognizes the great need for well-educated pharmacists. The College of Pharmacy is pledged to help meet this need through its program of academic and cooperative work and extracurricular activities, all of which are designed to prepare students effectively to become professional practitioners, to enter graduate schools, and to accept employment in the several branches of the pharmaceutical field.

In order to fulfill these aims special emphasis is placed upon the three pillars of a sound pharmacy education—teaching, research, and service. This goal necessitates closely integrated instruction in all of the pharmacy disciplines and its related areas, such as liberal arts, the humanities, and the basic sciences.

A new physical plant has been developed to facilitate these objectives, and additions to the pharmacy faculty are scholars who combine research and teaching as part of their regular commitment to the University.

It is intended that the academic, scientific, and professional environment created by the faculty and facilities will promote an atmosphere of inquiry and a healthy dissatisfaction for mediocrity.

The College will prepare its graduates to assume most effectively the intellectual, legal, civic, and moral responsibilities associated with the profession of pharmacy.

Since the professional standing of pharmacy is dependent upon those who are associated with it, the College seeks to enroll only those whose aptitudes, character, and attitudes are compatible with the profession and its goals.

Once a student has been accepted, the College endeavors to develop in the individual well-balanced personal qualities to meet these requirements.

The curriculum is designed to meet the needs of modern pharmacy in both theoretical and applied aspects, which will permit the graduate to enter the various fields of pharmacy. There is continuous search and experimentation for new and improved methods of teaching and subject material to be presented.

## The Future of Pharmacy

Pharmacy has grown far beyond the popular concept of the profession. To many the term "pharmacist" suggests a white-clad, somewhat mysteriously efficient dispenser of medicine in a neighborhood drugstore. It is true that among the 120,000 pharmacists practicing in America today approximately 100,000 work in retail pharmacies.

A good number of pharmacists, however, are employed in other rapidly growing branches of the profession. One of the fastest growing branches is hospital pharmacy, and another is industrial pharmacy. Some pharmacists find careers in the Armed Forces, government agencies, professional associations, and colleges.

Pharmacy is not restricted to men. Women now make up 14 per cent of the enrollment in pharmacy colleges, with the number increasing yearly. They comprise nearly 7 per cent of all practicing pharmacists and 33 per cent of the hospital pharmacists.

Several major trends in our national life assure further expansion of the pharmaceutical profession in the years ahead. Within our growing population, the average life span has increased to 67 years for men and 73 for women. Maintaining high standards of health for this enlarged population demands more well-educated pharmacists.

These same medical and pharmaceutical advances which contribute to a longer life span also expand the areas for research and the opportunity for improving existing drugs.

It is unnecessary to dwell on the tremendous increase in college applicants expected during the next decade. The need for trained men and women in the health professions indicates that colleges of pharmacy can expect to enroll a fair portion of the expanding student population.

Certainly the present enrollment in the nation's 74 accredited colleges of pharmacy is not adequate to meet the needs of the future.

### **Admission Requirements**

It is important that applicants for admission to the College of Pharmacy have studied the college preparatory curriculum. In particular, such students should be able to demonstrate strength in the sciences and in mathematics. The following subjects are required:

<b>Subject</b>	<b>Units</b>
English (4 years)	3
Foreign Language (2 years)	2
Science (Biology and Chemistry)	2
Mathematics	3
Other college preparatory subjects	3
Electives, not more than	2
	—
	15

### **Transfer with Advanced Standing**

Northeastern University College of Pharmacy welcomes transfer students who have successfully completed one or two years of preprofessional study in an accredited institution of college grade. A candidate for advanced standing should:

1. Have had courses which enable him to enter at the beginning of the second or third year and thereafter continue as a regular student.
2. Have earned average grades or better in his previous college work. (No credit is given for the lowest passing mark.)

Transfer students are admitted only in September to the College of Pharmacy.

## **GRADUATION REQUIREMENTS**

### **Quantitative Requirements**

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum. The curriculum appears on page 151.

Students who undertake cooperative work assignments must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

### **Qualitative Requirements**

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the field of specialization. Students will be expected to maintain an over-all average of C. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

### **Graduation with Honor**

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University for at least six quarters before they become eligible for honors at graduation.

### **Licensure**

Licensure may be obtained after graduation by passing the examination requirements established by the Massachusetts State Board of Pharmacy or those of other states.

### **Accreditation**

The College of Pharmacy is accredited by the American Council on Pharmaceutical Education and is a member of the American Association of Colleges of Pharmacy.

**PHARMACY****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
1.101	Basic Math.	3 3	10.102	Basic Math.	3 3	10.103	Basic Math. or	3 3
1.111	Calculus	3 3	10.112	Calculus	3 3	10.113	Calculus	3 3
1.121	Gen. Chem.	3(3) 4	12.122	Gen. Chem.	3(3) 4	12.123	Gen. Chem.	3(3) 4
1.111	Gen. Biol.	2(3) 3	18.112	Gen. Biol.	2(3) 3	18.113	Gen. Biol.	2(3) 3
1.101	English	3 3	30.102	English	3 3	30.103	English Mod. Lang. or	3 3
3.101	Mod. Lang. or	3 3				23.103	West. Civ.	3 3
1.201	West. Civ.	3 3	23.102	West. Civ.	3 3			
	Pharm. Orient	1 0	71.202	Pharm. Orient.	1 0	23.103	West. Civ.	3 3

**SECOND YEAR**

QUARTER 3A*			QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
2.114	Polit. Issues	5 2½	11.130	Physics	4 4	11.132	Physics	3(3) 4
4.142	Ethics	5 2½	12.141	Org. Chem.	3(3) 4	12.142	Org. Chem.	3(3) 4
0.149	Shakespearean Plays	5 2½	29.100	Pub. Speaking	3 3	29.101	Pub. Speaking	3 3
				Mod. Lang. or	4 4		Mod. Lang. or	4 4
			39.115	Elective Prin. & Prob. of Econ.	4 4	39.116	Elective Prin. & Prob. of Econ.	4 4

Required to be taken in June.

**THIRD YEAR**

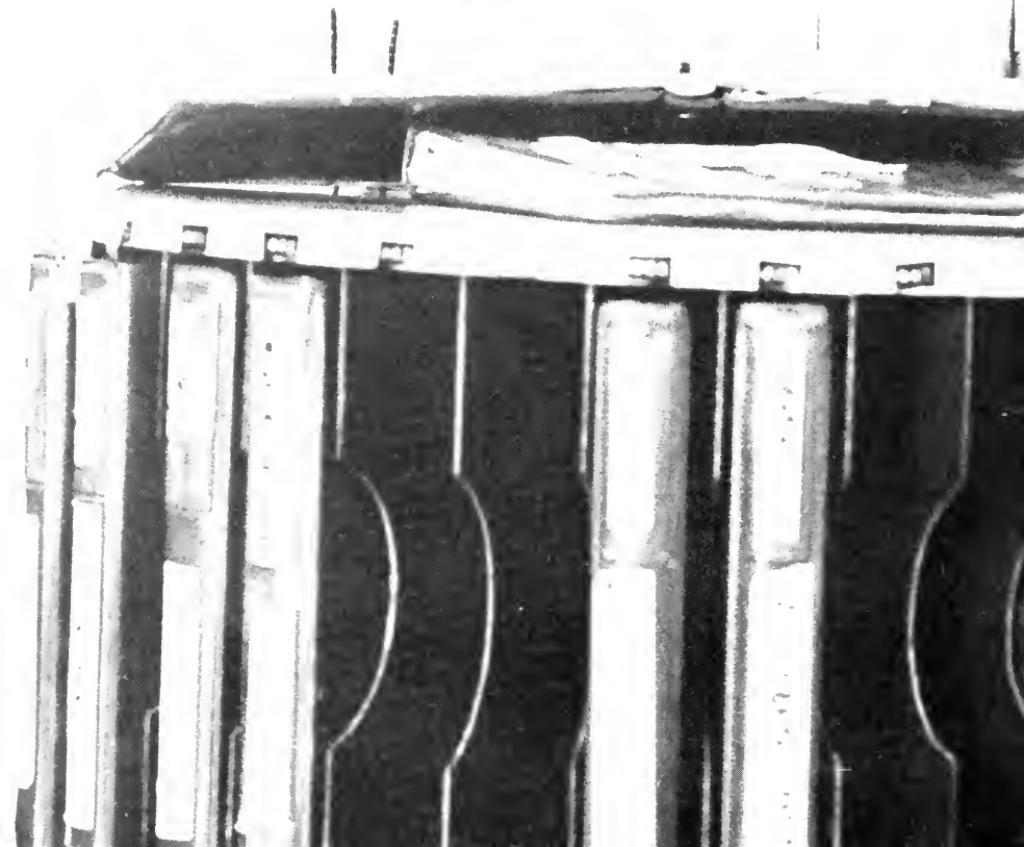
QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.131	Physics	3(3) 4	12.174	Anal. Chem.	4(4) 5
12.143	Org. Chem.	3(3) 4	18.148	Anat. (Hum.)	3(3) 4
18.120	Microbiology (Basic)	3(4) 4	41.208	Intr. to Acct.	4 4
71.211	Pharm. Method.	3(3) 4	71.212	Pharm. Prep.	3(3) 4

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.158	Physiology	3(3) 4	18.159	Physiology	3(3) 4
71.221	Phys. Pharm.	3(3) 4	71.222	Pharm. Tech.	3(3) 4
71.223	Business Law	4 4	72.221	Inorg. Med.	4 4
73.221	Pharmacognosy	4(3) 5	73.240	Biochemistry	4(6) 6

**FIFTH YEAR**

QUARTER 10			QUARTER 11			QUARTER 12		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
71.234	Pharm. Juris.	3 3	71.232	Prescrip. Pharm.	4(3) 5	71.233	Prescrip. Pharm.	4(3) 5
72.222	Drug Analysis	4(4) 5	71.237	Drug Marketing	4 4	71.238	Ret. Pharm. Mgmt.	4 4
72.231	Org. Medicinals	4 4	72.232	Org. Medicinals	3 3	72.233	Org. Medicinals	3 3
73.231	Pharmacology	3(3) 4	73.232	Pharmacology	3(3) 4	73.233	Pharmacology	3(3) 4
73.237	Pharmacognosy	3 3	73.238	Public Health	3 3	73.239	Public Health	3 3
90.251	Placement Tech.	1 1						





## *College of Nursing*

**Dr. Charlotte E. Voss, Dean**



## Purpose and Plan of the College

The College of Nursing offers two distinct educational programs which prepare individuals to practice nursing. One is three years in length and leads to the degree of Associate in Science; the other is five years in length and leads to the degree of Bachelor of Science in Nursing. Both programs accept qualified male and female applicants.

The associate degree curriculum is designed for students who meet the general requirements for admission to college and who are strongly motivated toward giving direct patient care.

All instruction is at the college level, but all courses are not identical in content with those given in the first three years of a curriculum leading to the Bachelor of Science in Nursing degree.

The baccalaureate degree curriculum in nursing is designed for students who meet the requirements for admission to the College and who desire to pursue a professionally oriented educational program in nursing. Its purpose is to prepare students to practice professional nursing in a variety of settings. It serves as a foundation for further professional development and graduate study.

## Educational Method

In common with the other Basic Colleges at Northeastern, curricula of the College of Nursing are distinctive in that they operate on the Cooperative Plan, which the University has long applied to technical and professional curricula in many fields. Each student has practical experience as a paid employee of one of the cooperating health agencies in addition to college instruction. The cooperative work does not carry academic credit, but successful completion of this phase of the program is an integral part of the requirements for graduation.

During their periods of employment, students have an opportunity to increase their nursing skills and to earn a major part of their expenses. At current rates, the students earn about \$1,400 each year. It should be noted that this cooperative feature is supplementary to the academic program and does not take the place of any academic or clinical course work normally required in preparation for the degree.

Cooperative students' duties increase in scope and in responsibility as they demonstrate competence to assist the professional nursing staff. Care is exercised to see that students are given cooperative assignments for which they are adequately prepared.

The first year of the program comprises 36 weeks of continuous full-time study at the University with formal instruction in nursing beginning immediately. There are 13 weeks following the freshman year when the students are free for vacation.

Cooperative work begins with the opening of the second year in September, when the students will be divided into two equal groups, Division A and Division B. Division A students attend the University for a 12-week period of instruction while their alternates in Division B are at work in one of the co-

operating health agencies. At the end of the fall term, the two groups change places, Division B students returning to the University, where the first period of instruction is repeated for them, and Division A students taking over the co-operative assignments in the health agencies.

In this manner the two divisions alternate for the remainder of the program, one student being on the job while the alternate is at college or on vacation; and both are graduated together in June. Upper-class students have 24 weeks of college study, 26 weeks of cooperative work and two weeks of vacation; the last year, students have 24 weeks of college study and 13 weeks of co-operative work.

### **Admission Requirements**

Candidates for admission to the College of Nursing must have been graduated from an accredited secondary school and have the recommendation of the school principal or guidance officer. The following subject-matter credits are required as preparation for the nursing curriculum:

#### **Associate Degree Program**

<b>Subjects</b>	<b>Units</b>
English (4 years) . . . . .	3
Mathematics . . . . .	2
Sciences . . . . .	2
Other college preparatory subjects . . . . .	6
Electives, not more than . . . . .	2
	—
	15

#### **Baccalaureate Degree Program**

<b>Subjects</b>	<b>Units</b>
English (4 years) . . . . .	3
Mathematics . . . . .	3
Biology, Chemistry, Physics . . . . . (Chemistry and Physics preferred)	2
Other college preparatory subjects . . . . .	7
	—
	15

Although the most important credential for admission to the College is a good high school record, all candidates are also required to write the Scholastic Aptitude Test. In addition, candidates for the Baccalaureate Degree Program are required to write certain Achievement Tests of the College Entrance Examination Board. The Achievement Tests should include: English Composition, Level I Mathematics, and either Biology or Chemistry.

Other factors considered by the Department of Admissions are the general health of the candidate and the degree of interest and motivation for the field of nursing.

## **Uniforms**

Students in the Associate Degree Program purchase uniforms in the fall quarter of the freshman year.

Students in the Baccalaureate Degree Program purchase uniforms in the fall quarter of the sophomore year.

The cost is approximately \$40.00.

## **GRADUATION REQUIREMENTS**

### **Quantitative Requirements**

Candidates for the degree of Associate in Science or Bachelor of Science in Nursing must successfully complete all of the prescribed courses in the applicable curriculum (see pages 157 and 158). They must also carry out effectively the prescribed periods of cooperative work at one or more of the health agencies associated with the University in the program of nursing education.

### **Qualitative Requirements**

The degree conferred not only represents the formal completion of the curriculum, but also indicates competence for beginning service as a staff nurse. An over-all scholarship average of at least C is required for graduation.

### **Graduation with Honor**

Candidates for the bachelor's degree whose academic achievement is extraordinary will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or highest honor. Students must have been in attendance at the University for at least six quarters before they become eligible for honors at graduation.

### **Graduation Fees**

In addition to the general University graduation fee of \$25.00, there is a charge of \$7.60 for the Graduation Pin.

### **Registration**

The program of the College prepares students for the professional examinations established by the Board of Registration in Nursing of the Commonwealth of Massachusetts. Students normally take these examinations for licensure as registered nurses shortly after graduation.

**ASSOCIATE DEGREE PROGRAM****ST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	
07 Integ. Sci.	4(3) 5	18.108	Integ. Sci.	4(3) 5	18.109	Integ. Sci.	4(3) 5	
00 Soc. Anthro.	4 4	19.102	Intr. Psych.	4 4	21.100	Prin. of Soc.	4 4	
01 English	3 3	30.102	English	3 3	30.103	English	3 3	
01 Fund. Nursing	4(4) 5	80.102	Fund. Nursing	4(4) 5	80.103	Fund. Nursing	4(4) 5	

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**COND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
29.100	Pub. Speak.	3 3	19.201	Abnorm. Psych.	4 4
82.100	Mat. & Child Care	6(18)12	80.100	Med'l Surg'l Nurs.	6(15)11

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**IRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. Hist. to 1865	4 4	23.211	U.S. Hist. from 1865	4 4
30.151	Mod. Novel	4 4	30.152	Mod. Drama	4 4
81.101	Med'l Surg'l Nurs. Elective	3(9) 6 4 4	83.101	Psych. Nurs. Elective	3(9) 6 4 4

**BACCALAUREATE DEGREE PROGRAM****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.I.
12.121	Gen. Chem.	3(3) 4	12.122	Gen. Chem.	3(3) 4	18.129	Biology	2(3)
18.127	Biology	2(3) 3	18.128	Biology	2(3) 3	20.100	Soc. Anthr.	4
23.101	Western Civ.	3 3	23.102	Western Civ.	3 3	23.103	Western Civ.	3
30.101	English	3 3	30.102	English	3 3	30.103	English	3
80.201	Nursing	2(3) 3	80.202	Nursing	2(3) 3	80.203	Nursing	2(3)

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**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.125	Physiology	2(3) 3	18.120	Microbiology	3(4) 4
18.148	Anatomy	3(3) 4	18.126	Physiology	2(3) 3
19.105	Found. of Psych. I	4 4	19.106	Found. of Psych. II	4 4
80.204	Nursing	4(3) 5	80.205	Nursing	4(3) 5

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**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
19.130	Soc. Psych.	4 4	23.211	U.S. from 1865	4 4
21.100	Prin. of Soc.	4 4		Sociology	4 9
23.210	U.S. to 1865	4 4		Nursing	
	Nursing	4(6) 6			

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**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
39.115	Economics	4 4	39.116	Economics	4 4
	Philosophy	4 4		Philosophy	4 4
	Nursing	9		Nursing	9

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**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
30.180	American Lit.	4 4	30.181	American Lit.	4 4
	Statistics	5 5		Nursing	9
	Nursing	9		Elective	3 3



## Boston-Bouvé College

Dr. Catherine L. Allen, Dean



In July 1964, its fiftieth-anniversary year, Bouvè-Boston School merged with Northeastern to become one of the nine undergraduate colleges of the University. Both men and women are enrolled in all of the departments of Boston-Bouvè College — Physical Education, Physical Therapy, and Recreation Education.

## PROGRAMS

### Physical Education

The program in Physical Education is planned to prepare teachers for public and private schools at all levels — elementary, secondary, and college — and for positions of leadership in organizations or agencies that conduct educationally oriented programs of physical activities.

Students pursue a carefully planned program that combines courses in liberal arts with courses in education and physical education.

The development and demonstration of skill in performance and teaching are an integral part of the professional course work. Leadership responsibilities and participation in the intramural-extramural program (for women) and in the athletic-intramural program (for men) are required experiences for qualification and an important phase of professional preparation. Students are assigned supervised teaching responsibilities in elementary and secondary schools throughout the Greater Boston area.

A modest expenditure will be required for physical education uniforms.

In addition, students increase their experiences with children through co-operative assignments, which include spending at least one summer during their college years in positions of leadership in camps, at playgrounds, or in other community programs.

### Physical Therapy

The physical therapist is a highly skilled member of a health profession concerned with the total rehabilitation of the patient. He or she works under the direction of a physician to carry out prescribed treatment procedures which are directed toward helping the patient regain functional independence. Treatment procedures include the use of heat, cold, massage, hydrotherapy, electrotherapy, and therapeutic exercise for the specific purpose of restoring the disabled individual to the optimum of his capacity.

The program of study is an integration of liberal arts and sciences and professional courses, with major emphasis on liberal arts in the first half of the program and on professional preparation in the latter half of the program.

The professional courses include such subjects as anatomy, kinesiology, clinical medicine, pathology, physiology, physical therapy procedures, and

practical experience in various hospitals and clinics. Professional ethics is stressed throughout the program.

Lecturers from Tufts University School of Medicine and the New England Medical Center Hospitals, as well as from the many medical and social agencies in the Boston area, augment the professional staff in the approved physical therapy program. Students completing the program are eligible to take state examinations for registration.

## **Recreation Education**

Recreation is a vital profession for a rapidly changing world. Prospects for the future clearly point toward increasing leisure time and more available income. Public recognition of the need for trained leadership in recreation programs for people of all ages during all seasons of the year has created new demands for career personnel.

Government agencies and educational institutions are expanding their programs. Recreation opportunities exist in community organizations, schools, and youth-serving agencies, churches, settlement houses, and hospitals; in business and industry; in the Red Cross, Peace Corps, and the military; in camps, resorts, and parks; in departments of recreation in schools and colleges; and in new centers developed by youth groups.

The program of study is based in the liberal arts and sciences, with introductory courses in professional education in the freshman year.

The acquisition of knowledge and skills in arts and crafts, camping, dramatics, music, sports, dance, aquatics, and adapted recreation for special groups is combined with leadership and organizational training.

Outdoor education, camp counseling, and programming are essential aspects of curriculum, and the Warren Center of Northeastern University offers an excellent and unusual teaching-learning laboratory within easy commuting distance of Boston.

Supervised field experiences in a variety of indoor and outdoor settings provide exciting, and at the same time practical, on-the-job opportunities with children, youth, and adults.

## **Admission Requirements**

To be eligible for admission, a candidate must have completed a college preparatory course in secondary school. Rank in class and recommendations

of the secondary school administrator should be high. Each student's college preparation should include:

Subjects	Units
English (4 years)	3
Mathematics (Geometry and Algebra preferred)	3 or more
Physical Sciences (Biology, Chemistry, Physics)	2 or more
Other college preparatory subjects	7
	<hr/>
	15

Biology, Chemistry, Physics are strongly recommended for all Physical Therapy and Physical Education applicants.

Foreign Language, Social Science, and Biology are important background subjects for Recreation careers.

Additional requirements basic to the admittance of all prospective majors in Physical Education, Recreation, and Physical Therapy are: good health, demonstrated ability to work with people, and the physical competence and skills to undertake the prescribed degree program.

## **GRADUATION REQUIREMENTS**

### **Degrees**

In Physical Education and Recreation Education the degree of Bachelor of Science in Education is awarded, and in Physical Therapy the Bachelor of Science in Physical Therapy. These degrees are awarded to qualified candidates who have completed the curricula as prescribed.

### **Quantitative Requirements**

Candidates for a degree must have completed one of the curricula listed on the following pages.

### **Qualitative Requirements**

Petition for upper division standing may be submitted after completion of 60 credits in the prescribed program, if an academic record of acceptable scholarship has been attained, inclusive of the term of petition. To continue in the professional program a student must achieve upper division status by the end of Quarter 7.

Transfer students are required to delay petition for upper division standing for one or more academic terms, until competence to perform adequately in the selected professional program has been demonstrated.

The cumulative quality point averages required to enter each class level are stated in the Student Handbook. After completing requirements for attainment of upper division standing the student is expected to maintain at least a C+ average or better in the field of specialization. Throughout the professional sequence the student must maintain these averages to enter field practice and to be recommended for graduation.

### **Graduation with Honor**

Candidates of distinctively superior achievement in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or highest honor. Students must have been in attendance at the University at least six quarters before they may become eligible for honors at graduation.

**PHYSICAL EDUCATION — MEN****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.127	Basic Biology	2(3) 3	18.128	Basic Biology	2(3) 3	18.129	Basic Biology	2(3) 3
23.101	West. Civ.	3 3	23.102	West. Civ.	3 3	23.103	West. Civ.	3 3
30.101	English	3 3	30.102	English	3 3	30.103	English	3 3
50.101	Soc. Sci.	3 3	50.102	Soc. Sci.	3 3	50.103	Soc. Sci.	3 3
61.200	Aquatics	1(3) 2	61.205	Gymnastics	1(2) 2	61.113	Sr. Life Sav., or	(3) 1
62.200	P.E. Orient.	1 1	61.210	Elem. Sch. Act.	(3) 1	61.201	Aquatics I	1(3) 2
						61.285	First Aid	1(2) 2

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.136	Physics or	3(3) 4	11.137	Physics	3(3) 4
12.135	Chemistry	3(3) 4	12.136	Chemistry	3(3) 4
19.102	Basic Psych.	4 4	30.171	Eng. Lit. or	4 4
30.170	Eng. Lit. or	4 4	30.181	Amer. Lit.	4 4
30.180	Amer. Lit.	4 4	50.121	H.D. & Learn. I	4 4
61.240	Int. Comb.	(3) 1	61.221	V.B. & Badm.	(3) 1
61.250	Anat. & Physiol.	3(2) 4	61.251	Anat. & Physiol.	3(2) 4

**THIRD YEAR**

QUARTER 6			QUARTER 7		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
50.131	H.D. & Learn. II	4 4	29.100	Public Speaking	3 3
61.235	Team Sports I	1(2) 2	61.230	S.S. Dance	(3) 1
61.252	Anat. & Physiol.	3(2) 4	Elect. (Coach.)	2(2) 3	
62.210	Prin. of P.E.	4 4	Elect. (Comb.)	1(2) 2	
65.210	Pers. Health	3 3	Electives	6 6	

**FOURTH YEAR**

QUARTER 8			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
61.236	Team Sports II	1(2) 2	61.220	Surv. Rec. Sports	(3) 1
61.245	Winter Sports	1(4) 3	61.237	Team Sports III	(3) 1
61.263	M.&M of P.E.	4 4	61.280	Camp Leadership	1(3) 2
62.253	Kinesiology	4 4	61.287	Ath. Training	2(2) 3
62.260	Meas. & Eval.	4 4	63.215	Trends, Issues, Rec.	3 3
			65.215	Sch. & Comm. Hlth.	3 3

**FIFTH YEAR**

QUARTER 10			QUARTER 11		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
23.210	U.S. to 1865	4 4	23.211	U.S. after 1865	4 4
61.212	Hand. & Squash	(3) 1	50.151	Bkgrd. of Am. Ed.	4 4
62.254	Physio. of Exer.	3(2) 4	62.270	Admin. of P.E.	4 4
62.255	Adapted P.E.	3(2) 4	Elective (P.E.)	1(3) 2	
	Elective	4 4	Elective	3 3	

In addition, 12 Q.H. of Student Teaching are required in the senior year.

**PHYSICAL EDUCATION — WOMEN****RST YEAR**

QUARTER 1			QUARTER 2		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.127	Basic Biology	2(3) 3	18.128	Basic Biology	2(3) 3
30.101	English	3 3	30.102	English	3 3
50.101	Social Science	3 3	50.102	Social Science	3 3
60.121	P.E. Skills	1(3) 2	60.122	P.E. Skills	2(4) 3
62.200	P.E. Orient	1 1	60.150	Human Anat.	2(3) 3
65.120	Health Ed.	3 3			

QUARTER 3*			QUARTER 3A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.129	Basic Biology	2(3) 3	60.125	Camp Leadership and Outdoor Education	4
30.103	English	3 3			
50.103	Social Science	3 3			
60.123	P.E. Skills	2(4) 3			
60.151	Human Anat.	3 3			

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.136	Physics or	4 4	11.137	Physics or	4 4
12.135	Chemistry	4 4	12.136	Chemistry	4 4
19.102	Basic Psych.	4 4	30.181	Literature	4 4
30.180	Literature	4 4	50.121	Human Dev.	4 4
60.131	P.E. Skills	2(4) 3	60.132	P.E. Skills	2(4) 3

**HIRD YEAR**

QUARTER 6			QUARTER 7A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.125	Human Physiol.	2(3) 3	60.141	Anal. of P.E.	2(4) 3
50.131	Human Dev.	4 4	60.143	Winter Sports	1
60.140	Analysis P.E.	2(4) 3	60.220	P.E. Elem. Sch.	4 4
60.160	Instr. Aids	2 2	62.260	Meas. & Eval.	4 4
62.210	Hist., Prin. P.E.	4 4	65.216	M&M Health Ed.	4 4

QUARTER 8A			QUARTER 9		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.126	Human Physiol.	2(3) 3	60.135	Camp Leadership and Outdoor Ed.	4
60.142	Analysis P.E.	2(4) 3			
62.253	Kinesiology	4 4			
63.215	Trends, Iss. Rec.	3 3			
	or				
63.135	Social Rec.	2 2			
	Elective	4 4			

**OURTH YEAR**

QUARTER 9A			QUARTER 10A			QUARTER 11A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
0.280	Supervised Teaching	12	60.230	Adv. Tch. & Anal. or Elective	2(4) 3	50.151	Bkgrnd. Amer. Ed.	4 4
			62.254	Physiol. of Exer.	3(3) 4	60.230	Adv. Tch. & Anal. or Elective	2(4) 3
			62.270	Admin. P.E.	4 4	60.261	Curric. Bldg. & Trnd.	4 4
			65.218	Public Health	3 3	62.255	Adapted P.E.	4 4

Additional Requirement: Basic Programmed Mathematics Course to be completed prior to or concurrent with courses that relate.

**PHYSICAL THERAPY****FIRST YEAR**

QUARTER 1			QUARTER 2		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.101	Basic Math.	3 3	10.102	Basic Math.	3 3
12.121	Gen. Chemistry	3(3) 4	12.122	Gen. Chemistry	3(3) 4
18.127	Basic Biology	2(3) 3	18.128	Basic Biology	2(3) 3
30.101	English	3 3	30.102	English	3 3
65.129	Health Ed.	3 3	60.101	Physical Ed.	(2) 1
			64.111	Intr. Phys. Ther.	1(1) 1

QUARTER 3*			QUARTER 3A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
10.103	Basic Math.	3 3	60.125	Summer Camp (Elective)	8
12.123	Gen. Chemistry	3(3) 4			
18.129	Basic Biology	2(3) 3			
30.103	English	3 3			
60.102	Physical Ed.	(2) 1			
64.112	Intr. Phys. Ther.	1(1) 1			

**SECOND YEAR**

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
11.136	Physics	3(3) 4	11.137	Physics	3(3) 4
19.102	Basic Psych.	4 4	50.121	Human Dev.	4 4
Soc. Sci. Elect.	4 4		Soc. Sci. Elect.	4 4	
or					
History Elective	4 4		History Elective	4 4	
Human. Elective	4 4		Human. Elective	4 4	
or					
Mod. Lang. Elect.	4 4		Mod. Lang. Elect.	4 4	

**THIRD YEAR**

QUARTER 6			QUARTER 7A			QUARTER 8A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.125	Human Physiol.	2(3) 3	64.131	Applied Anat.	2(3) 3	18.126	Human Physiol.	2(3) 3
29.100	Speech	3 3	64.140	Phys. Ther. Proc.	3(6) 5	64.150	Phys. Ther. Proc.	3(6) 5
64.121	Gross Anat.	3(6) 5	64.210	Pathology	3 3	64.221	Clinical Med.	2 2
Elective	4 4		64.220	Clinical Med.	3 3	64.235	Psychiatry Elective	3 3
			65.218	Public Health	3 3			4 4

**FOURTH YEAR**

QUARTER 9A			QUARTER 10A			QUARTER 11A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
64.160	Phys. Ther. Proc.	1(6) 3	64.170	Phys. Ther. Proc.	2(9) 5	64.195	Spvsd. Clin. Prc.	(40) 8
64.165	Prof. Lit. & Rehab.	2 2	64.222	Clin. Med.	3 3			
64.185	Clinical Pract.	(17) 5	64.245	Applied Physiol.	2(3) 3			
64.190	Clinical Sem.	1	64.175	Ethics & Admin.	2 2			
64.240	Electrotherapy	3 3		Elective	4 4			
64.250	Neuroanatomy	3 3						

\*Additional Requirement: Basic Programmed Mathematics Course to be completed prior to or concurrent with courses that relate.

## RECREATION EDUCATION

## RST YEAR

QUARTER 1			QUARTER 2		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.127	Basic Biology	2(3) 3	18.128	Basic Biology	2(3) 3
30.101	English	3 3	30.102	English	3 3
50.101	Soc. Sci.	3 3	50.102	Soc. Sci.	3 3
63.120	Orient. Rec.	1 1	63.122	Rec. Skills II	1(6) 3
63.121	Rec. Skills I	(6) 2	63.150	Hum. Anat.-Func.	3 3
65.129	Health Educ.	3 3			

QUARTER 3*			QUARTER 3A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
18.129	Basic Biology	2(3) 3	63.125	Outdoor Educ. & Camp Leadership	4
30.103	English	3 3			
50.103	Soc. Sci.	3 3			
63.123	Rec. Skills III	1(6) 3			
63.151	Hum. Anat. Func.	3 3			

## ECOND YEAR

QUARTER 4			QUARTER 5		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
16.111	Earth Science I	4 4	16.112	Earth Science II	4 4
19.102	Basic Psych.	4 4	30.181	American Lit.	4 4
30.180	American Lit.	4 4	50.121	Human Dev.	4 4
63.126	Outdoor Educ.	(3) 1	63.127	Outdoor Educ.	(3) 1
63.131	Rec. Leadership	1(6) 3	63.132	Interagency Plng. for Com. Action	3 3
63.133	Rec. Skills IV	(6) 2	63.134	Rec. Skills V	(6) 2

## THIRD YEAR

QUARTER 6A			QUARTER 7A			QUARTER 8A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
8.125	Hum. Physiol.	2(3) 3	63.143	Winter Sports	1	18.126	Hum. Physiol.	2(3) 3
7.171	Art & Archit.	3 3	63.210	Phil. of Rec. & Leisure	3 3	27.172	Art & Archit.	3 3
9.100	Public Speak.	3 3	63.220	M & M in Rec.	3 3	63.129	Outdoor Educ.	(3) 1
9.163	Play Prod. Wrkshp.	4 4	63.250	Group Dynamics	3 3	63.260	Org. & Admin. of Rec. & Parks	4 4
63.128	Outdoor Educ.	(3) 1	63.240	Dance & Cult.	2(3) 3	63.265	Tech. Sup. Evl.	3 3
63.160	Dev. & Util. of Rec. Educ. Res.	3 3	63.255	Adapted Rec. Spec. Groups	3 3	63.270	Arts & Crafts	1(6) 3

## FOURTH YEAR

QUARTER 9A			QUARTER 10A			QUARTER 11A		
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.
63.280	Superv. Field Exp. and Teaching, and Seminar	12	63.290	Senior Seminar and Projects	4 4	21.111	Amer. Society	4 4
			65.218	Public Health Selected Elective	3 3	63.285	Rsch. & Read. in Rec.	4 4
				Selected Elective	4 4		Selected Elective	4 4
				Selected Elective	4 4		Selected Elective	4 4

\*Additional Requirement: Basic Programmed Mathematics Course to be completed prior to or concurrent with courses that relate.





## *College of Criminal Justice*

**Robert Sheehan, Acting Dean**



## COLLEGE OF CRIMINAL JUSTICE

### **General Objective**

The College of Criminal Justice, established in 1966 under a grant from the Ford Foundation, prepares young men and women for professional careers in law enforcement. The curriculum has been designed primarily for students interested in municipal and state police service. However, federal investigative agencies and industrial security operations in private industry also offer many challenging and rewarding opportunities. It is expected that a number of graduates will choose to pursue advanced study in academic fields ranging from social work to public administration. The program of study in the College of Criminal Justice is admirably suited to preparation for admission to the Northeastern School of Law, which will be reestablished in 1968 and which will give special emphasis to the education of trial lawyers.

It is evident that this new college is urgently needed to meet a growing social problem of our times. Methods of police administration and law enforcement are changing drastically to cope with contemporary developments. Those engaged in this important service to society now need much more formal education than in the past.

Northeastern's new College of Criminal Justice will make a substantial contribution to the education of professional personnel in law enforcement in the years ahead.

### **Methods and Purpose**

The College of Criminal Justice offers a five-year academic program on the Cooperative Plan of Education which allows a candidate for the baccalaureate degree to undertake a highly specialized program of study. It is anticipated that "co-op" assignments will include work in police departments, juvenile and adult correctional institutions, and probation, parole and social agencies. At present, only the Bachelor of Science degree with concentration in the field of Law Enforcement is offered. Plans are under way to develop other curricula in Corrections, Delinquency Prevention, and Security.

The student will receive a broad educational background for his future specialized role in law enforcement. Course work in the social sciences and the humanities will be integrated with studies in juridical theory and practice, since the student will be preparing himself for a career involving the social problems of people from all walks of life. The liberal content of the curriculum is not only highly desirable for its value as a foundation upon which his general intellectual development may be based, but also as an indispensable educational requirement for professional service in his field of special interest.

The graduate must be prepared to judge objectively the many socio-economic problems inherent in the administration of justice in contemporary

American society. Obsolete and intellectually antiquated methods of administering justice have no place in a highly developed urban-industrial civilization. The College of Criminal Justice of Northeastern University will help prepare the student for a career which will not only be personally productive and rewarding but intellectually stimulating as well. He will become a pioneer in one of America's most important newly emerging professions.

## **ADMISSION REQUIREMENTS**

All applicants are expected to have completed the following subject-matter units:

<b>Subject</b>	<b>Units</b>
English (4 years)	3
Foreign Language (2 years)	2
Mathematics (minimum)	1
Science (minimum)	1
Other college preparatory subjects	4
Electives, not more than	4
TOTAL	15

## **GRADUATION REQUIREMENTS**

### **Quantitative Requirements**

Candidates for the Bachelor of Science degree must complete all of the prescribed work of the curriculum. The curriculum appears on page 172.

Students who undertake cooperative work assignments must meet the requirements of the Department of Cooperative Education before they become eligible for their degrees.

No student transferring from another college or university is eligible to receive a degree until at least one year of academic work immediately preceding graduation has been completed at Northeastern.

### **Qualitative Requirements**

The degree conferred not only represents the formal completion of the subjects in the selected course of study but also indicates professional competence in the field of specialization. Students will be expected to maintain an over-all average of C. Those who are clearly unable to meet the accepted standard of attainment will be required to withdraw from the University.

### **Graduation with Honor**

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty, a limited number of this group may be graduated with high honor or with highest honor. Students must have been in attendance at the University for at least three years before they become eligible for honors at graduation.

**CRIMINAL JUSTICE****FIRST YEAR**

QUARTER 1			QUARTER 2			QUARTER 3				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
16.106	Earth Science	3	3	16.107	Earth Science	3	3	16.108	Earth Science	3
22.101	Intr. Pol. Sci. I	3	3	22.102	Intr. Pol. Sci. II	3	3	22.103	Intr. Pol. Sci. III	3
23.101	West. Civ. I	3	3	23.102	West. Civ. II	3	3	23.103	West. Civ. III	3
30.101	English I	3	3	30.102	English II	3	3	30.103	English	3
	Mod. Lang.	3	3		Mod. Lang.	3	3		Mod. Lang.	3
92.101	Intr. Crim. Just.	1	1	92.102	Intr. Crim. Just.	1	1	92.103	Intr. Crim. Just.	1

**SECOND YEAR**

QUARTER 4			QUARTER 5				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
19.105	Found. Psych. I	4	4	19.106	Found. Psych. II	4	4
22.131	Amer. Nat. Govt.	4	4	22.141	Govt. & Pol. States	4	4
41.111	Prin. of Acctg.	4	3	41.112	Prin. of Acctg.	4	3
92.110	Pol. Comm. Rel.	3	3	92.111	Police Patrol	3	3

**THIRD YEAR**

QUARTER 6			QUARTER 7				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
21.100	Prin. of Soc.	4	4	21.130	Criminology	4	4
92.121	Civil Liberties			92.122	Criminal Law: Procedural Due Process	3	3
	Substantive Due Process	3	3	92.124	Court Procedure	3	3
92.123	Crim. Investigation & Case Prep.	3	3	92.125	Evidence	3	3
19.202	Abnorm. Psych I	4	4	19.203	Abnor. Psych. II or General Elective	4	4
	or				Those who have taken Abnorm. Psych. I will take Abnor. Psych. II		
41.113	Prin. of Acctg.	4	4				
	General Elective	4	4				

**FOURTH YEAR**

QUARTER 8			QUARTER 9				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
21.150	Race Relations	4	4	21.145	Urban Society	4	4
22.261	Pub. Admin.	4	4	92.132	Interviews & Interr.	3	3
92.131	Invest. Rep. Writing	3	3	92.134	Pol. Juven. Meth.	3	3
92.133	Intr. to Crimin.	2(2)	3	92.135	Iden. & Rec. in Law Enforcement	3	3

**FIFTH YEAR**

QUARTER 10			QUARTER 11				
No.	Course	Cl. Q.H.	No.	Course	Cl. Q.H.		
92.141	Traff. Law Enforce.	3	3	92.144	Police Plann.	3	3
92.142	Pol. Supervision	3	3	92.145	Computer Tech. in Law Enforce.	3	3
92.143	Law Enforcement Admin. & Mgmt.	3	3	92.150	Research Meth. in Law Enforce.	3	3
	Elective	4	4	92.151	Seminar in Law Enforcement	3	3

# *Teaching Staff and Courses of Instruction*

On the pages which follow are given in numerical order the synopses of courses offered in the several curricula of the Basic Colleges. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

Courses in the part-time evening programs in the College of Engineering are identical with those in the full-time day program.

A "quarter" hour equals approximately three clock hours of work: ordinarily one hour of class and two hours of preparation a week for a quarter of twelve weeks. Laboratory and drawing courses normally require fewer hours of outside preparation and, therefore, carry less credit than lecture courses.

The University reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

## **ABBREVIATIONS**

Prereq.	Prerequisite
Cl.	Class Hours
Lab.	Laboratory Hours
Q.H.	Quarter Hours

# Civil Engineering Department

**Professor**

Ernest L. Spencer, Chairman,  
B.S., M.S., P.E. (Mass.)

**Associate Professors**

Leroy M. Cahoon, B.S., M.S.,  
P.E. (Mass.)  
Joseph S. Firnkas, Ing., P.E. (Mass.)  
Alvin S. Goodman, B.S., M.S., Ph.D.,  
P.E. (Mass., N.Y.)  
Kenneth M. Leet, B.S., M.S., Ph.D.  
Joseph H. Lenney, B.S., M.S.,  
P.E. (Mass.)  
Robert L. Meserve, B.S., M.S.,  
P.E. (Mass.)  
Saul Namyet, B.S., P.E. (Mass.,  
N.Y.)  
Edward R. Pershe, B.S., M.S., Ph.D.,  
P.E. (Ohio, Neb.)

**Visiting Associate Professor**

Robert C. Stiefel, B.S., M.S.,  
P.E. (Penn.)

**Assistant Professors**

Reginald Amory, B.S., M.S.  
John J. Cochrane, B.S., M.S., Ph.D.  
William Domey, B.S., M.S., P.E.  
(Mass.)  
Constantine J. Gregory, B.A., M.S.,  
Ph.D.  
Walter E. Jaworski, A.S., B.S., M.S.  
C. Andrew Pretzer, B.S., M.S., Ph.D.,  
P.E. (Mass.)

**1.100 Introduction to Civil Engineering**

1 Cl.; 1 Q.H.

History of Civil Engineering, present status and future trends, needed research; the interaction of the Civil Engineer with man and his environment; interrelationships with architects, other engineering disciplines, planners, government and professional societies.

**1.110 Surveying I**

Prereq. 10.143; 3 Cl.; 3 Lab.; 4 Q.H.

Basic surveying principles with field applications; theory of measurements and survey calculations for traverses; stadia, topography, horizontal and vertical curves, earthwork calculations, with electronic computer applications.

**1.111 Surveying II**

Prereq. 1.110; 4 Cl.; 3 Lab.; 5 Q.H.

Spiral easement curves; electronic measurement; basic photogrammetry and theory and practice of astronomical surveying. Laboratory portion consists of complex problem solutions with emphasis on electronic computer applications.

**1.113 Computer Applications in Surveying**

Prereq. Basic Surveying; 2 Cl.; 2 Q.H.

Primarily for transfer students who have had a recognized course in surveying but no work with programming for high-speed electronic digital computers. Programming techniques and their applications to the solution of surveying problems.

**1.120 Fluid Mechanics I**

Prereq. 1.140; 4 Cl.; 4 Q.H.

Fluid properties; fluid statics; buoyancy; stability of dams; continuity; Euler and Bernoulli equations; momentum; general energy equation; viscosity; dimensional analysis; dynamic similarity; lift and drag; model testing; flow measurement; fluid machinery.

**1.121 Fluid Mechanics II** Prereq. 1.120; 3 Cl.; 3 Q.H.  
Flow of incompressible fluids in pipes; analyses of pipe networks and systems involving reservoirs, pipes, pumps, and turbines; open channel flow including uniform flow and elementary problems involving local phenomena and varied flow. Compressible flow in pipes.

**1.126 Fluid Mechanics** Prereq. 2.101; 3 Cl.; 3 Q.H.  
Fluid properties; fluid statics; continuity; Euler and Bernoulli equations; momentum; general energy equation; dimensional analysis; pipe friction; lift and drag; introduction to potential flow theory.

**1.130 Highway and Construction Engineering** Prereq. 1.111; 4 Cl.; 4 Q.H.  
The engineering considerations in the planning and construction of modern highway systems. Administration agencies, traffic studies, and highway financing; flexible and rigid pavement design; an introduction to the Critical Path Method for scheduling and analyzing construction costs.

**1.131 Highway & Construction Engineering** Prereq. 1.111; 2 Cl.; 2 Q.H.  
For Part-Time Civil Engineering Program. The engineering considerations in the planning and construction of modern highway systems; administration agencies, traffic studies, and highway financing.

**1.132 Highway and Construction Engineering** Prereq. 1.131; 2 Cl.; 2 Q.H.  
For Part-Time Civil Engineering Program. Flexible and rigid pavement design; introduction to the Critical Path Method for scheduling and analyzing construction costs.

**1.140 Structural Mechanics I** Prereq. 11.102; 4 Cl.; 4 Q.H.  
Fundamental concepts; force systems; resultant forces; equilibrium forces; friction; centroids; first and second moments of areas.

**1.141 Structural Mechanics II** Prereq. 1.140; 4 Cl.; 4 Q.H.  
Stress and strain, mechanical properties of materials. Theories of failure, axially loaded members, buckling and torsion.

**1.142 Structural Mechanics III** Prereq. 1.141; 4 Cl.; 4 Q.H.  
Shear and bending moment diagrams; flexural and shear stresses in beams, straight, curved, symmetrical and unsymmetrical; analysis of two-dimensional and three-dimensional trusses; influence lines for determinate structures.

**1.143 Structural Analysis I** Prereq. 1.142; 4 Cl.; 4 Q.H.  
Methods of computing deflections of trusses, beams, and frames by virtual work, moment-area, Williot-Mohr, Bar Chain, Costiglano's method and Maxwell's Law. Effects of load, temperature, fabrication errors and support motion are considered.

**1.144 Structural Analysis II** Prereq. 1.143; 3 Cl.; 3 Q.H.  
Methods of stress analysis of statically indeterminate structures including superposition, slope deflection, moment distribution and least work.

**1.145 Structural Analysis III** Prereq. 1.144; 3 Cl.; 3 Q.H.  
Matrix methods of structural analysis for the treatment of beams, frames, grids and trusses.

**1.146 Structural Mechanics IA** Prereq. 11.102; 2 Cl.; 2 Q.H.  
For Part-Time Civil Engineering Program. Fundamental concepts; force systems; resultant forces; equilibrium forces.

**1.147 Structural Mechanics IB** Prereq. 1.146; 2 Cl.; 2 Q.H.  
For Part-Time Civil Engineering Program. Centroids; first and second moments of areas.

**1.148 Structures** Prereq. 2.103; 3 Cl.; 3 Q.H.  
The analysis and design of simple structures with emphasis on structures of special interest to Mechanical Engineers; correlation of the assumptions made in Structural Design with the principles of strength of materials.

**1.150 Concrete Design I** Prereq. 1.141; 4 Cl.; 4 Q.H.  
Use of reinforced concrete as structural material; analysis of behavior of reinforced concrete members and modes of failure; deduction of theory of design based on ultimate strength and on theory of elasticity; design flexural members, bond, anchorage, cut-off lengths, continuous members; evaluation of design versus field conditions and resulting conclusions with respect to safety.

**1.151 Concrete Design II** Prereq. 1.150; 3 Cl.; 3 Q.H.  
Diagonal tension; design of vertical and inclined shear reinforcing; analysis and design of columns; effects of shrinkage and creep on structures; special structural systems; design of prestressed concrete standard sections; connection and erection details.

**1.160 Structural Design I** Prereq. 1.141; 4 Cl.; 4 Q.H.  
The design of individual members in structural frameworks using latest specifications; the end connections for the members designed.

**1.161 Structural Design II** 1.160; 3 Cl.; 3 Lab.; 4 Q.H.  
The design of built-up members; composite design; plastic design; simple design projects to be completed by the student.

**1.170 Geology** 4 Cl.; 4 Q.H.  
Origin and composition of earth's crust — soil, rocks, clay and rock mineralogy, weathering, stream and shoreline problems, glaciers, earth movements, elements of hydrologic cycle, geological mapping and exploration.

**1.172 Soil Mechanics** Prereq. 1.170; 4 Cl.; 4 Q.H.  
Types and methods of soil classification; soil-water phase relationships; basic introduction to soil stabilization, seepage and ground water flow, stress distributions, consolidation theory, and shear strength of soils. Demonstrations of the basic laboratory tests.

**1.180 Materials** Prereq. 12.113; 4 Cl.; 4 Q.H.  
The structure, properties, production and usage of construction materials, including inorganic materials such as cement and concrete, ferrous and nonferrous metals and alloys, glass, stone and brick, and organic materials including wood and plastics; insulating materials and protective coatings.

**1.182 Experimental Methods in Engineering Mechanics**

Prereq. 1.141; 1 Cl.; 4 Lab.; 4 Q.H.

Survey of experimental techniques and instrumentation, experimental determination of basic material properties for concrete, wood, metals, and other engineering materials, and introduction to model analysis.

**1.190 Sanitary Engineering I**

Prereq. 1.121; 4 Cl.; 4 Q.H.

Introduction to city planning, including methods of predicting population and economic growth; urban renewal, transportation, zoning, and financial planning; unit operations of water and sewage treatment; flow sheets and hydraulic layout of water and sewage treatment; elements of stream sanitation.

**1.191 Sanitary Engineering II**

Prereq. 1.190; 4 Cl.; 4 Q.H.

Problems in applied hydrology; design of water supply facilities, water distribution systems, and sanitary and storm sewer systems; refuse disposal, air pollution, and other topics in environmental health engineering.

**1.192 Sanitary Engineering III**

Prereq. 1.190; 3 Cl.; 3 Lab.; 4 Q.H.

Process design of water and sewage treatment; plants; biology and chemistry of water and waste water; plant design, including instrumentation and mechanical and electrical features; laboratory work and reports covering analysis of water and wastes, and process applications.

## Mechanical Engineering Department

**Professors**

Arthur R. Foster, Chairman, B.S.,  
M.Eng.  
John F. Dunn, S.B., S.M., Sc.D.  
Melvin Mark, B.S., M.S., Sc.D.  
Welville B. Nowak, S.B., Ph.D.  
Joseph J. Zelinski, B.S., Ph.D.

**Assistant Professors**

William O. Bruehl, B.S.  
Thomas C. Coleman, Jr., B.S., M.S.  
Richard Maddon, B.S., M.S., Ph.D.  
Richard J. Murphy, B.S., M.S., Ph.D.  
Ralph Sexton, B.S., M.S.

**Associate Professors**

Ralph S. Blanchard, Jr., B.S., M.S.  
Bertram S. Long, B.S., M.S., M.E.  
Ernest E. Mills, B.S., M.S.  
Warren G. Nelson, S.B., S.M., Sc.D.  
Thomas E. Phalen, Jr., B.S., M.S.  
Alvin J. Yorra, B.S., M.S.  
John Zotos, B.S., M.S.

**Instructors**

John H. Cashman, B.S., M.S.  
Juris Krumins, B.S., M.S.  
Andrew Levine, B.S., M.S.  
John C. O'Callahan, B.S., M.S.  
John Swanson, B.S., M.S.

**2.100 Introduction to Mechanical Engineering**

1 Cl.; 1 Q.H.

History of Mechanical Engineering, present status and future trends, needed research; the interaction of the Mechanical Engineer with man and his environment; interrelationships with other engineering disciplines, government and professional societies.

**2.101 Mechanics I**

4 Cl.; 4 Q.H.

Forces, moments and couples; resultants and equilibrium of force systems; internal forces; statically indeterminate problems; stress, strain; relationships between stress and strain; mechanical properties of materials.

**2.102 Mechanics II**

4 Cl.; 4 Q.H.

Centroids and centers of gravity; moments of inertia of area; shear and moment equations and diagrams; singularity functions; torsion of circular shafts; combined axial and torsional loading; symmetrical and unsymmetrical bending; combined stresses in bending; beam deflections.

**2.103 Mechanics III**

4 Cl.; 4 Q.H.

Kinematics of particles, plane motion; kinematics of rigid body plane motion, including rotating reference frames using analytical and graphical techniques; friction; force, mass, acceleration analysis of rigid body plane motion; mass moments of inertia.

**2.104 Mechanics IV**

4 Cl.; 4 Q.H.

Space motion, particles and rigid bodies; work and energy; impulse and momentum; Euler's equations; stability phenomena, including column buckling.

**2.105 Fluid Mechanics I**

Prereq. 2.104; 3 Cl.; 3 Q.H.

Fundamental concepts, description of forces and motion in a fluid; conservation of mass, momentum, and energy as applied to systems and control volumes; dimensional analysis.

**2.106 Fluid Mechanics II**

Prereq. 2.105; 4 Cl.; 4 Q.H.

Two-dimensional potential flow; viscous effects; laminar and turbulent flow; boundary layer theory; pipe flow; elements of one-dimensional isentropic compressible flow; shock waves.

**2.107 Vibration and Control**

Prereq. 2.104; 4 Cl.; 4 Q.H.

Analysis of single and multiple degree of freedom vibrating systems; simple feedback control problems.

**2.108 Design Fundamentals**

Prereq. 2.104; 4 Cl.; 4 Q.H.

Advanced Strength of Materials with emphasis on design applications, including stress analysis, deflection analysis, theories of failure and selection of materials, stress concentrations, creep and plasticity, fluctuating loads for ductile and brittle materials; principles of design.

**2.109 Machine Design**

Prereq. 2.108; 4 Cl.; 4 Q.H.

Application of design fundamentals to mechanical elements and complete machines. Optimum and creative design are included in a project study.

**2.115 Mechanics A**

4 Cl.; 4 Q.H.

Resultants and equilibrium of force systems; centroids; moments of areas; internal forces; point stress; strains; statically indeterminate problems; torsion.

**2.116 Mechanics B** Prereq. Civil Eng. Statics; 4 Cl.; 4 Q.H.  
Introduction to kinematics and kinetics of particles and rigid bodies; work and energy; inertia of masses.

**2.117 Mechanics C** Prereq. 2.101; 3 Cl.; 3 Q.H.  
Introduction to kinematics and dynamics of particles and rigid bodies; inertia of masses.

**2.118 Mechanics D** Prereq. 2.115; 4 Cl.; 4 Q.H.  
Bending stresses and strains; inertia of masses; kinematics and dynamics of particles and rigid bodies; work and energy.

**2.119 Mechanics E** Prereq. 2.115; 4 Cl.; 4 Q.H.  
Bending stresses and strains; kinematics of particles including rotating reference frames using analytical and graphical techniques.

**2.120 Thermodynamics** Prereq. Old 14.66; Old 15.56; 3 Cl. 3 Q.H.  
Fundamental concepts of thermodynamics; properties of pure substances, work and heat; the first law of thermodynamics; the second law and entropy; ideal gases; mixtures of ideal gases.

**2.121 Thermodynamics I** Prereq. Old 14.66; Old 15.56; 4 Cl.; 4 Q.H.  
Fundamental concepts of thermodynamics; properties of pure substances, work, and heat; the first law of thermodynamics; the second law and entropy; ideal gases; mixtures of ideal gases; availability, irreversibility and efficiency.

**2.122 Thermodynamics II** Prereq. 2.121; 4 Cl.; 4 Q.H.  
Detailed study of thermodynamic principles and their application in engineering; power plant cycles; refrigeration cycles; reciprocating machinery; air standard otto and diesel cycles; flow through nozzles and blade passage.

**2.123 Thermodynamics III**  
Discussion of thermodynamic relations, equations of state and deviation equations for ideal gases are discussed followed by consideration of combustion phenomena and its application to heat engines. Detailed development of thermochemistry, chemical equilibrium and chemical potential and application of the resulting equations to combustion engines.

**2.124 Heat Transfer** Prereq. 2.123; 4 Cl.; 4 Q.H.  
Modes of heat transfer; steady state conduction, one and two dimensions; transient conduction; mathematical and graphical techniques; electrical analogy; forced convection; natural convection; radiation; condensation and boiling heat transfer; heat exchangers.

**2.125 Nuclear Engineering** Prereq. 11.104, 2.124; 3 Cl.; 2 Lab.; 4 Q.H.  
Structure of the atom with emphasis on the nucleus; the characteristics and detection of alpha, beta, and gamma radiation; isotope formation, radioactive decay, nuclear reactions; cross sections for absorption, scattering, and fission; types of reactors, elementary reactor theory, reactor heat transfer, waste disposal, health physics, radiation detection, and uses of radioisotopes.

**2.126 Thermodynamics IV**

Selected subjects of current interest in thermodynamics, including elementary kinetic theory, statistical mechanics and quantum mechanics; discussion of their relationship to classical thermodynamics. Specialized problems in thermodynamics.

**2.127 Direct Energy Conversion**

Prereq. 2.123; 4 Cl.; 4 Q.H.

The principles of direct energy conversion by magnetohydrodynamic power generators, thermionic converters, fuel cells, and thermoelectric converters. The unified theory of energy conversion. Irreversible thermodynamics.

**2.128 Thermodynamics**

Prereq. 2.120; 3 Cl.; 3 Q.H.

Thermodynamic principles and their application in engineering; availability, irreversibility, and efficiency; reciprocating machinery; power and refrigeration cycles.

**2.140 Materials and Metallurgy**

2 Cl.; 3 Lab.; 3 Q.H.

Structures of solids; imperfections in crystals; phase diagrams; effect of temperature on the structure and properties of materials (recrystallization, recovery, precipitation, diffusion); strengthening mechanisms; mechanical properties of materials; properties of the iron-carbon system and high temperature alloys.

**2.141 Materials Science**

Prereq. 2.121; 3 Cl.; 3 Lab.; 4 Q.H.

Crystallography; structure of solids; imperfections in crystals; phase equilibrium basic mechanisms of metal strengthening and mechanical behaviour; and the effect of temperature on the structure and properties of materials (recrystallization, recovery, precipitation, rate processes).

**2.142 Materials and Processes**

Prereq. 2.141; 4 Cl.; 2 Lab.; 5 Q.H.

Ferrous metallurgy; plasticity theory; fracture and failure; metallurgical principles of casting, joining, forming, and cutting.

**2.143 Materials Science A**

Prereq. 11.104, 10.145; 3 Cl.; 3 Q.H.

A basic background in the physical properties of solids. This should be sufficient for students interested in a broad scope as well as those who wish to continue in the area. Specific material includes crystallography; structure of solids; crystal growth; imperfections in solids; phase equilibria; phase changes; effect of temperature on structure and properties of materials (rate processes, diffusion); and electric and optical properties of solids.

**2.160 Mechanical Engineering Laboratory I**

Prereq. 2.102, 9.103; 2 Cl.; 3 Lab.; 4 Q.H.

Principles of engineering experimentation and instrumentation, including the proper design of experiments to minimize experimental error and uncertainty; thorough introduction to the analog computer; stressed in lectures and in tests on machines particularly suited to illustrate above and commensurate with students' academic background.

**2.161 Mechanical Engineering Laboratory II**

Prereq. 2.160, 2.104, 2.105, 2.123; 4 Lab.; 3 Q.H.

Further application of principles learned in 2.160 by drawing on the students' increased theoretical preparation in performing experiments on equipment illustrating the principles of thermodynamics, strength of materials, heat transfer and fluid mechanics. Effective use is made of the digital as well as the analog computer.

**2.162 Mechanical Engineering Laboratory III**

Prereq. 2.161, 2.142, 2.124, 2.106; 4 Lab.; 3 Q.H.

Project type experiments. Students are required to utilize principles learned in 2.160 and 2.161 by choosing, researching, designing and managing experiments involving independent and, insofar as possible, original investigations in any of the fields of mechanical engineering that are of particular interest to them.

**2.191 Mechanical Engineering Senior Project**

Prereq. 2.161, and consent of Dept. Head; 4 Lab.; 3 Q.H.

Students with high scholastic standing may propose a special project. This special project, if permitted, will be substituted for 2.162. Projects may be of an analytical, design, or experimental nature, and a formal report is submitted to the student's supervisor at the end of the quarter.

**2.214 Experimental Stress Analysis**

4 Cl.; 4 Q.H.

Theory and application of mechanical and electrical strain gauges; installation, instrumentation and circuitry of gauge set-ups for transducer use and experimental stress analysis; use of brittle coatings; theory and practice of photoelastic methods as applied to models and coatings.

**2.232 Physical Metallurgy** Prereq. 2.141, 2.142 or equivalent; 4 Cl.; 4 Q.H.

Atomic structure and bonding; atomic basis for elasticity; anisotropic elastic behaviour; anelastic behaviour; equilibrium and non-equilibrium studies of one-, two-, and three-component systems; oxidation; corrosion; electrical and magnetic behaviour.

# Electrical Engineering Department

## Professors

Harold R. Raemer, Chairman,  
B.S., M.S., Ph.D.  
Sze-Hou Chang, B.S., M.S., Ph.D.  
Laurence F. Cleveland, B.S., M.S.  
Bell A. Cogbill, B.S., M.S.  
Ladislav Dolansky, Ing., S.M., E.E.,  
Ph.D.  
Benjamin M. Rabinovici, Ing. Dipl.  
E.E., M.S.E.E., Dr. Sc.  
Wilfred J. Remillard, B.S., M.S., Ph.D.  
J. Spencer Rochefort, B.S., M.S.  
Robert D. Stuart, M.A., Ph.D., C.Eng.  
Wilfred J. Remillard, B.S., M.S., Ph.D.

## Assistant Professors

Robert M. Duff, B.S., M.A.  
Robert A. Gonsalves, B.S., M.S., Ph.D.  
Wayne G. Kellner, B.S., S.M., Sc.D.  
Martin S. Levetin, B.S.  
Robert N. Martin, B.S., M.S.  
Lawrence J. O'Connor, B.S., M.S.  
Meng Chi Tsen, B.S., M.S.  
Lih-Jyh Weng, B.S., M.S.

## Associate Professors

Ralph E. Bach, Jr., B.S., M.S., Ph.D.  
Marcello Carrabes, B.S., M.S.  
Basil L. Cochrun, B.S., M.S.  
James M. Feldman, B.S., M.S., Ph.D.  
Arvin Grabel, B.S., M.S., Sc.D.  
William F. King, B.S., M.S.  
Walter H. Lob, B.S., M.S.  
Morton Loewenthal, B.S., Ph.D.  
Louis J. Nardone, B.S., M.S.  
Charles A. Renton, B.S., Ph.D.  
Sheldon S. Sandler, B.S., M.A., Ph.D.  
Martin Schetzen, B.S., S.M., Sc.D.  
Walter S. Schwab, S.B., S.M., Ph.D.  
Jacob Wiren, B.S., M.S.

## Instructors

Richard A. Bean, B.S., M.S.  
Hi D. Chai, B.S., M.S.  
Gordon F. Currin, B.S., M.S.  
Joseph K. DeRosa, B.S., M.S.  
Thomas W. Glynn, B.S., M.S.  
Hooshang Mahoi, M.E., M.S.  
Nathan D. Phillips, B.S., M.S.  
Peter A. Schnieper, B.S.  
Chester Stanhope, B.S., M.S.  
Elwood Streeter, B.S.

### 3.100 Introduction to Electrical Engineering

1 CI.; 1 Q.H.

History of Electrical Engineering; present status and future trends; needed research; interaction of the Electrical Engineer with man and his environment; interrelationships with other engineering disciplines, government and professional societies.

### 3.111 Circuit Theory I

3 CI.; 3 Q.H.

Introductory course to electric circuit theory covering Kirchhoff's laws, network topology, loop and nodal analysis, Thevenin's theorem, dependent sources, two-part network analysis, power and energy.

### 3.112 Circuit Theory II

Prereq. 3.111, 10.144; 3 CI.; 3 Q.H.

An introduction to the properties of linear, time-invariant systems; exponential excitation, system function, complex-frequency plane, singularity function, impulse response.

**3.113 Circuit Theory III** Prereq. 3.112, 10.145; 3 Cl.; 3 Q.H.  
Review and extension of selected introductory circuit theory techniques; analysis of nonlinear circuits; piecewise-linear analysis and synthesis techniques; phase-plane solution of simple nonlinear circuits; parametric circuits.

**3.114 Distributed Circuits and Waves** Prereq. 3.113, 3.161; 3 Cl.; 3 Q.H.  
Electromagnetic waves on transmission lines and in space; acoustic waves in waveguides and in fluids; transmission and absorption phenomena; radiation efficiency and impedance of antenna and electromechanical transducers.

**3.121 Signals and Systems I** Prereq. 3.113, 10.147; 3 Cl.; 3 Q.H.  
Introduction to complex variables with specific application to exponential transform theory; solution of differential equations and circuit analysis utilizing exponential transforms; signal flow graphs; root locus.

**3.122 Signals and Systems II** Prereq. 3.121; 3 Cl.; 3 Q.H.  
Pulse, periodic, and random signals and their associated spectra; correlation, convolution, and sampling; probability distribution functions and random-variable theory; signal transmission through linear systems; singularity function.

**3.123 Control Systems** Prereq. 3.121; 3 Cl.; 3 Q.H.  
Analysis and design of linear and nonlinear control systems; compensation methods, statistical design techniques, and stability analysis; introduction to sampled data systems.

**3.131 E. E. Laboratory I — Measurements** Prereq. 3.112; 1 Cl.; 3 Lab.; 3 Q.H.  
Basic electrical measurements and the development of measuring systems; measurement techniques with error analysis; waveform errors in averaging type instruments; electric machinery and electronic circuits will be used as models for measurement.

**3.132 E. E. Laboratory II — Measurements** Prereq. 3.112, 3.131; 1 Cl.; 3 Lab.; 3 Q.H.  
A continuation of measurements laboratory with more sophisticated measurements; student projects involving the synthesis of a measuring system.

**3.133 E. E. Laboratory III — Active Devices** Prereq. 3.131, 3.141; 1 Cl.; 3 Lab.; 3 Q.H.  
The terminal behavior of active devices; bandwidth, power gain, power level, dynamic range and operating bias; synthesis of a controlled source for a specific application.

**3.134 E. E. Laboratory IV — Transducers** Prereq. 3.131, 3.122; 1 Cl.; 3 Lab.; 3 Q.H.  
Photo-sensitive, thermo-sensitive, electro-mechanical and magneto-electric transducers; synthesis of an elementary system.

**3.135 E. E. Laboratory V — System Evaluation**

Prereq. 3.134, 3.143, 3.171; 1 Cl.; 3 Lab.; 3 Q.H.

Analysis and design of multistage devices such as wave shaping circuits, basic logic systems, communication systems, amplifiers; transfer characteristics of electric machines; system synthesis project.

**3.136 E. E. Laboratory VI — Advanced Systems**

Prereq. 3.123, 3.135, 3.143; 1 Cl.; 3 Lab.; 3 Q.H.

Use of analog and digital computer in the analysis of complex systems; senior thesis project.

**3.141 Electronics I**

Prereq. 3.113, 11.140; 3 Cl.; 3 Q.H.

Development of the fundamental principles of operation of transistors and other devices from solid-state physics; development of circuit models for low- and high-frequency representation and piecewise-linear models; bias considerations and regions of operation for transistors and other electron devices.

**3.142 Electronics II**

Prereq. 3.121, 3.141; 3 Cl.; 3 Q.H.

The properties of simple amplifiers; development of gain, frequency response, and impedance relations in single-stage and cascaded RC and d-c amplifiers. Analysis techniques used, such as signal flow graphs, matrix methods, and log-modulus (Bode) plots, are related to the physical operation and limitations of the devices employed.

**3.143 Electronics III**

Prereq. 3.142; 3 Cl.; 3 Q.H.

The concepts of feedback developed and applied to amplifier circuits and waveform generators; the problems of gain, frequency response, interstage loading, and stability quantitatively discussed; analysis and design approaches for multivibrators, sweep circuits, and sinusoidal oscillators.

**3.151 Communications Theory and Practice**

Prereq. 3.122, 3.143; 3 Cl.; 3 Q.H.

Introduction to classical modulation theory and to some of the more recent developments in communication theory. AM and FM theory and models; sampling, pulse-modulation systems, multiplexing, and noise; signal space and correlation detection; entropy and channel capacity.

**3.161 Field Theory I**

Prereq. 10.147, 11.104; 3 Cl.; 3 Q.H.

The basic principles of electromagnetic fields; vector analysis review; analogies between field and circuit concepts; fundamental quantities and units; electrostatic and magnetostatic fields; boundary conditions; Coulomb, Biot-Savart and Faraday's Laws; solutions of Laplace and Poisson equations for simple electrostatic configurations; electric and magnetic dipoles; Maxwell equations.

**3.162 Field Theory II**

Prereq. 3.161; 3 Cl.; 3 Q.H.

Resistance, capacitance and inductance from the field viewpoint; electric and magnetic polarization and susceptibility; complex fields; waves in dielectrics; power flow; reflection and refraction; standing waves; dipole radiation; introduction to waveguide and cavity concepts.

**3.163 Field Theory III**

Prereq. 3.162; 3 Cl.; 3 Q.H.

Introduction to modern applications of electromagnetic field theory; motion of charges particles in fields; electrostatic and magnetic deflection and focussing; diode, cyclotron, synchrotron, magneto-ionics, ferrites, electron beam-wave interactions; waves on periodic structures, traveling-wave tubes; elementary plasma physics concepts; magneto-hydrodynamics.

**3.171 Energy Conversion I**

Prereq. 3.113, 3.161; 3 Cl.; 3 Q.H.

Magnetics and magnetic circuits; the basic principles of electromagnetic energy conversion in translation and rotating devices; the idealized d-c machine with particular emphasis on the dynamic operating conditions.

**3.172 Energy Conversion II**

Prereq. 3.171; 3 Cl.; 3 Q.H.

Static devices with emphasis on transformers; three-phase circuits, including application to transformer connections; the synchronous machine as an electromagnetic energy converter; consideration of both the steady-state and dynamic states of operation.

**3.173 Energy Conversion III**

Prereq. 3.172; 3 Cl.; 3 Q.H.

The induction machine as a rotating energy conversion device; polyphase and single-phase induction motors; symmetrical component analysis applied to the unbalanced conditions; emphasis on the steady-state and dynamic operating conditions.

**3.181 Electrical Engineering I**

Prereq. 10.143; 3 Cl.; 3 Q.H.

Principles of electric circuit analysis employing the LaPlace transform in the solution of lumped linear variant networks; transient and steady-state analysis of active and passive networks. Open to E. E. Majors.

**3.182 Electrical Engineering II**

Prereq. 3.181; 3 Cl.; 3 Q.H.

Principles of electric systems including power sources and distribution, active components, transducers, and electro-mechanical devices; analysis and synthesis of automatic control systems; emphasis on each topic determined according to major discipline. Not open to E. E. Majors.

**3.215 Modern Circuit Theory**

Prereq. 3.122; 3 Cl.; 3 Q.H.

A review and integration of previously acquired knowledge of circuit theory, particularly with respect to circuit classification; the establishment of a philosophy of formal synthesis as a useful and informative part of engineering design; the development of an appreciation for the utility and intrinsic value of certain mathematical methods of analysis for linear systems; for example, matrices and other linear algebra concepts as applied to linear circuit theory.

**3.221 Electrical Energy Systems and Sources**

Prereq. 3.171; 3 Cl.; 3 Q.H.

This course with 3.222 is designed to give a broad view of the structure of those electric systems whose primary function is energy transfer, and especially those whose function is the transfer of large quantities of energy. The functions of the various system elements are described and their significant characteristics are investigated briefly. The interrelation between elements is treated.

**3.222 Electrical Energy Systems and Sources II** Prereq. 3.221; 3 Cl.; 3 Q.H.  
A continuation of 3.221. Problems such as voltage control, protection, economics, and planning which relate to the system as a whole are investigated. Taken with 3.221, it provides a general background for more intensive studies in analysis, stability, protection, economics, and planning of electric power systems.

**3.234 E. E. Laboratory** Prereq. 3.131, 3.122; 1 Cl.; 3 Lab.; 3 Q.H.  
Similar to 3.134 except emphasizing power aspects where appropriate.

**3.235 E. E. Laboratory** Prereq. 3.234, 3.143, 3.171; 1 Cl.; 3 Lab.; 3 Q.H.  
Similar to 3.135 except emphasizing power aspects where appropriate.

**3.236 E. E. Laboratory** Prereq. 3.235, 3.123, 3.172, 3.143; 1 Cl.; 3 Lab.; 3 Q.H.  
Similar to 3.136 except emphasizing power aspects where appropriate.

**3.241 Design Problems in Electronics** Prereq. 3.143; 3 Cl.; 3 Q.H.  
An introduction to the art of practical design through the use of specific design examples, such as feedback regulators. The specification compromises necessary to maximize the total usefulness of the circuit will be evolved, as will the experimental techniques necessary to verify the analytical design. An attempt will be made to interrelate many of the analytical concepts presented in earlier courses. Student participation encouraged; laboratory demonstrations provided.

**3.291 Computer Applications in Science and Industry** Prereq. 10.147; 3 Cl.; 3 Q.H.

Description of the computing facilities available for solution of today's engineering problems and an introduction to some methods of problem-solving. The advantages of hybrid computation are stressed. Representative problems will be chosen for solution either by digital computer or by analog computer under control of digital logic. Some familiarity with basic analog methods and the concepts of Boolean algebra is assumed.

**3.292 Mathematical Techniques in Electrical Engineering I** Prereq. 3.122, 3.162; 3 Cl.; 3 Q.H.

Definition and representation of a complex variable and of functions of a complex variable. Topics covered include conformal mapping, singularities, Laurent series, residues, and contour integration. Electrical engineering applications of complex variable theory such as Fourier theory, Hilbert transforms, conformal transformations in the analysis of linear systems and in electrostatics.

**3.293 Mathematical Techniques in Electrical Engineering II** Prereq. 3.113, 3.142; 3 Cl.; 3 Q.H.

Matrix notation and rules of matrix algebra are initially introduced from the historical point of view. The solubility of sets of linear equations, concepts of determinants, linear transformations, invariance, quadratic forms and eigenvalues are then developed. Throughout, illustrative applications of matrix techniques are made for the formulation and solution of certain problems in Electrical Engineering drawn from the realms of circuit theory, probability theory, and engineering physics.

# Chemical Engineering Department

**Professors**

Ralph A. Troupe, Chairman,  
B.S., M.S., Ph.D., P.E. (Mass., Tex.)  
Charles S. Keevil, S.B., S.M., Sc.D.,  
P.E. (Mass., Cal.)

**Assistant Professors**

Ralph A. Buonopane, B.S., M.S., Ph.D.  
Charles E. Speight, B.S., M.S.  
John A. Williams, B.S., M.S., Ph.D.

**Associate Professors**

Bernard M. Goodwin, B.S., Sc.D.  
Richard R. Stewart, B.S., M.S., Ph.D.

**Instructor**

Elliot Weisman, B.S., M.S.

**4.100 Introduction to Chemical Engineering**

1 Cl.; 1 Q.H.

History of Chemical Engineering, present status and future trends; needed research. The interaction of the Chemical Engineer with man and his environment; interrelationships with other engineering disciplines, government and professional societies.

**4.101 Chemical Engineering Calculations I** Prereq. 12.116; 3 Cl.; 3 Lab.; 4 Q.H.

Application of the fundamental laws of mass and energy conservation and equilibrium concepts to chemical and physical processes; economic considerations leading to optimal solutions. A computational laboratory is included to improve the facility of the student in handling sophisticated problems. Analog and numerical approaches are stressed where applicable.

**4.102 Chemical Engineering Calculations II** Prereq. 4.101; 3 Cl.; 3 Q.H.

Simultaneous application of energy and mass conservation laws coupled with equilibrium considerations to comprehensive problems selected from the chemical processing industries; both steady and unsteady state processes.

**4.104 Commercial Chemical Development** Prereq. 4.101, 12.116; 3 Cl.; 3 Q.H.

Designed to enable the student to make the transition from theoretical chemistry to the industrial process. Interrelationships between processes are studied from the standpoint of economics, raw materials, and apparatus. Problems requiring qualitative as well as quantitative reasoning.

**4.111 Chemical Engineering I** Prereq. 4.102; 3 Cl.; 3 Q.H.

The important unit operations of Chemical Engineering. Fluid mechanics, heat transfer, and evaporation.

**4.112 Chemical Engineering II** Prereq. 4.111; 3 Cl.; 3 Q.H.

A continuation of 4.111. Drying, distillation, absorption, and extraction.

**4.121 Chemical Engineering III** Prereq. 4.112; 4 Cl.; 4 Q.H.

A study of Chemical Engineering from the transport phenomena standpoint. Introduction to fluid properties, derivations of the conservation equation for mass, momentum, and energy; solutions of differential equations in conduction; unsteady state heat transfer; and laminar fluid motion.

**4.122 Chemical Engineering IV**

Prereq. 4.121; 4 Cl.; 4 Q.H.

A continuation of 4.121. Convective heat transfer, turbulent fluid motion, mass transfer by molecular and eddy diffusion; mass transfer in laminar and turbulent motion; and simultaneous heat, mass, and momentum transfer.

**4.123 Experimental Methods I**

Prereq. 4.112; 2 Cl.; 4 Lab.; 4 Q.H.

Introduction to experimental engineering methods; basic measurements, design of experimental apparatus, laboratory report writing, design of experiments, and data accuracy are stressed. Suitable experiments are performed.

**4.124 Experimental Methods II**

Prereq. 4.123; 2 Cl.; 4 Lab.; 4 Q.H.

A continuation of 4.123 with emphasis on the development of an experimental program, reduction of data, and presentation of results; use of computers in simulating experimental conditions, and for constructing mathematical models are stressed.

**4.125 Material Science**

Prereq. 12.162, 12.148; 4 Cl.; 4 Q.H.

The properties and applications of metals, plastics, and ceramics in general, with particular emphasis given to those materials problems which are encountered in the chemical engineering profession; modern theories of solid-state physics emphasizing the molecular and structural concepts upon which the physical properties of engineering materials depend; also, the classical thermodynamic theories dealing with solids.

**4.126 Chemical Engineering Thermodynamics**

Prereq. 4.102, 12.162; 4 Cl.; 4 Q.H.

The first law and its application to batch and flow systems; heat effects in chemical and physical processes; thermodynamic properties; the second law; entropy; physical and chemical equilibria; emphasis on the fundamental principles and mathematical relationships and their application to the analysis and solution of a variety of engineering problems.

**4.131 Process Design**

Prereq. 4.122, 4.126; 1 Cl.; 6 Lab.; 7 Q.H.

The class participates in the process design of a chemical plant capable of producing a specified annual tonnage of a chemical when specific raw materials are available. The fundamentals of chemical engineering science, practice, analysis and economics which have been studied in previous courses are used to prepare a report containing flow sheets, material and energy balances, designs of processing units, and cost estimates of the capital requirements for procuring, erecting, and operating the plant.

**4.132 Process Design**

Prereq. 4.131; 1 Cl.; 6 Lab.; 7 Q.H.

Each student or a small group of students designs a chemical plant to produce a specified annual tonnage of one or more chemicals with a specific feed stock. The techniques used in Process Design I are used by each student to prepare an individual process design report and cost estimate for the particular plant assigned.

**4.133 Projects**

Prereq. Senior student and consent of Dept.; 1 Cl.; 6 Lab.; 7 Q.H. Individual research related to some phase of chemical engineering. Open only to students selected by the department head on the basis of scholarship and proved ability. Research topic selected by mutual agreement of the student and his supervising professor.

**4.134 Projects**

Prereq. 4.133; 1 Cl.; 7 Lab.; 7 Q.H.

A continuation of the research work undertaken in 4.133.

**4.135 Introduction to Nuclear Engineering**

Prereq. 10.147; 11.104; Cl.; 4 Q.H.

Review of nuclear physics; nuclear fission, the nuclear chain reaction; reactor theory, radiation shielding; materials of construction; reactor instrumentation and control; separation of stable isotopes; chemical separation; processing and special techniques of nuclear engineering.

**4.136 Chemical Engineering Kinetics**

Prereq. 12.162, 4.126; 4 Cl.; 4 Q.H.

Fundamental theories of a rate of chemical change including collision and transition state theory in homogeneous reacting systems; integral and differential analysis of kinetic data and a design of batch and continuous flow chemical reactors; catalysis theory and design of catalytic reactors.

**4.141 Junior Honors Program**

Prereq. Approval of Dept.; To be assigned.

Those students undertaking a Junior Honors Program may petition for two credits for the research problem undertaken.

## **Industrial Engineering Department**

**Professors**

James M. Moore, Chairman,  
B.M.E., M.S., Ph.D.  
Austin W. Fisher, Jr., B.S., Sc.D.

**Instructors**

Urban Meyer, Dipl. M.E.  
Robert Slater, B.I.E.

**Associate Professors**

David R. Freeman, B.S., M.S., Ph.D.  
Thomas E. Hulbert, B.S., M.S., P.E.  
(Mass.)

**5.100 Introduction to Industrial Engineering**

1 Cl.; 1 Q.H.

Orientation course designed to assist freshman in selecting his engineering specialty by amplifying the problem areas within Industrial Engineering. Typical I.E. problems discussed at a nontechnical level, illustrating the interrelating systems of managerial activities.

**5.120 Work Design I**

2 Cl.; 3 Lab.; 3 Q.H.

The philosophies and principles of Work Design. Includes techniques such as: work sampling, input and output models, sequence and flow of work techniques, assembly charts, flow process chart, flow diagrams, mathemati-

cal models, repetitive models, operation charts, therblig charts, multiactivity charts, body-member path of movement analysis, physiological models, nonrepetitive work models, research models for the study of work. Laboratory projects will apply principles to a typical work situation in a factory, hospital, or university.

**5.121 Work Design II**

Prereq. 5.120; 2 Cl.; 3 Lab.; 3 Q.H.

Work measurement techniques such as: time study, measuring operator performance, factors restricting performance, standard data, predetermined motion time systems, mathematical techniques, application of allowances; application of the work design approach, using cases to illustrate the procedures; work measurement installations and principles using an existing system for analysis.

**5.122 Flow Processes**

2 Cl.; 2 Q.H.

Continuous time processes and their system analogs, discrete flow and analysis, and network flow analysis.

**5.123 Systems and Computers**

2 Cl.; 2 Q.H.

Systems analysis, the consideration of multiple interaction, is explored using Electronic Data Processing. Among the topics covered are the philosophical implications, decision theory, servo-mechanism theory, organization theory, and computer simulation of business systems.

**5.124 Manufacturing Processes**

2 Cl.; 3 Lab.; 3 Q.H.

Principles and techniques to be considered in processes for the manufacture of major articles of commerce with emphasis on process design and cost and consideration of process control and automation; metal working, forming, machining, and bonding; job-shop tooling and techniques; plastics and rubber forming and extruding; textiles, paper, electronics, food processing, and other manufacturing operations in which Industrial Engineering is applied.

**5.125 Product Evaluation and Value Analysis**

2 Cl.; 2 Lab.; 3 Q.H.

Principles and procedures to obtain optimum value in products; complete value analysis study; methods of revealing excessive costs; concepts of value; value tests; function-cost relationship; creativity; specialty "Vendors"; government contracts; relationship of value analysis to design, manufacturing, procurement and installation.

**5.140 Introduction to Probability**

Prereq. 10.143 Calculus; 4 Cl.; 4 Q.H.

Fundamentals of probability theory and applications: set theory, events, probabilities defined on event spaces, independence, conditional probability, Bayes' theorem, random variables, discrete and continuous distributions, moments, functions of random variables, joint distributions, and classical distributions.

**5.141 Statistical Inference**

Prereq. 5.140; 3 Cl.; 3 Q.H.

The theory of making inferences from samples or incomplete information: sampling theorems, point estimation, confidence interval estimation, tests of hypotheses for means and variances of distributions, and an introduction to decision theory and Bayesian Inference.

**5.142 Reliability and Quality Control** Prereq. 5.141; 2 Cl.; 3 Lab.; 3 Q.H.  
Applied probability and statistical inference techniques are utilized in reliability analysis and quality control. Both theory and application are discussed in relation to a total quality assurance program.

**5.143 Design of Experiments** Prereq. 5.141; 3 Cl.; 3 Q.H.  
The theory and application of statistical techniques to the efficient design of experiments, including factorial analysis, analysis of variance, multiple regression, forecasting of time series, statistical decision theory, Markov processes.

**5.144 Quality Control** Prereq. 5.245; 3 Cl.; 3 Q.H.  
Sampling inspection procedures involving both attributes and variables, single and double sampling plans, control charts for fraction defective, variables control charts, operating characteristic curves, Military Standard Sampling Plans. Not open to Industrial Engineers.

**5.146 Engineering Statistics** 3 Cl.; 3 Q.H.  
Civil Engineering applications of fundamental probability distributions, including the Binomial, Exponential, Poisson and Hypergeometric; conditional probability; addition and multiplication laws; statistical inference with testing of hypotheses on variability and central tendency; and curve fitting with least squares.

**5.161 Operations Research I** Prereq. 5.141; 4 Cl.; 4 Q.H.  
The application of Operations Research as a tool for management decision-making, including such techniques as linear programming, queuing theory, dynamic programming, and game theory.

**5.162 Production and Inventory Control** Prereq. 5.140; 3 Cl.; 3 Q.H.  
Inventory models will be studied for deterministic and stochastic demand and lead time. Emphasis on model building, considering sensitivity and analysis of models, plus scheduling techniques.

**5.163 Operations Research II** Prereq. 5.161; 3 Cl.; 3 Q.H.  
Mathematical development of theoretical operations research techniques, case studies of actual applications; term projects.

**5.164 Plant Layout and Design** Prereq. 5.121, 5.122, 5.140; 2 Cl.; 3 Lab.; 3 Q.H.  
Application of quantitative techniques such as queuing theory and engineering economy to problems involving facilities planning and materials handling; basic graphical tools; models for plant layout; laboratory projects.

**5.180 Management Information Systems** 2 Cl.; 2 Q.H.  
Determination of what type of information management requires for reasonable decision-making and how it should be collected, stored, summarized, and reported for maximum utilization on the part of the industrial firm.

**5.181 Personnel and Motivation** 3 Cl.; 3 Q.H.  
The individual in the industrial environment; work theory, human relations; modern personnel practices based on the behavioral sciences; job description and evaluation; wage and salary administration including incentives; problems of innovation; case studies for situational analysis.

**5.182 Quantitative Distribution Systems**

Prereq. 5.140; 3 Cl.; 3 Q.H.

Analysis of the relationship of engineering to the distribution system; sales engineering; markets for consumer goods; channels of distribution; background of firm making the product; company policies related to selling; econometrics; quantitative techniques for warehousing, routing, delivery, advertising; marketing legislation and selling practices.

**5.183 Organizations**

2 Cl.; 2 Q.H.

History of the development of industrial organizations; organization theory, structures and practical problems; the coordinative functions of management; line-staff relationships; case studies of the implications of organizational problems and their solutions.

**5.184 Industrial and Labor Relations**

3 Cl.; 3 Q.H.

Historical and motivational background of the labor movement; union organization and philosophy; management and government as factors in labor relations; collective bargaining; industrial relations and the engineer.

**5.185 Senior Seminar**

3 Cl.; 3 Q.H.

Summation and correlation of all prior work using a local company as an example. Management personnel will discuss the line and staff functions of the company, such as: engineering, industrial relations, manufacturing, finance, distribution, research. Class analysis of the company will be the basis of discussion.

**5.245 Basic Engineering Statistics**

Prereq. 10.143; 4 Cl.; 4 Q.H.

Basic probability distributions, including the Binomial, Exponential, Poisson and Hypergeometric; laboratory data analysis; statistical tests of hypotheses about central tendency and variability; curve fitting with least squares on Mechanical Engineering data.

**5.260 Engineering Economy**

4 Cl.; 4 Q.H.

Economic analysis in formulating business policies with emphasis on engineering aspects; criteria and techniques of engineering economy as related to cost, economy of design, economy of selection; application to engineering projects; study of cash flow, income taxes, replacement economy, increment and sunk costs, capital rationing, rate of return, decisions involving multiple alternatives, and dealing with uncertain risks.

**5.265 Fundamentals of Engineering Economy**

3 Cl.; 3 Q.H.

Economic analysis in formulating business policies with emphasis on engineering aspects; criteria and techniques of engineering economy as related to cost, economy of design, economy of selection, and application of engineering projects; study of cash flow, income taxes, replacement economy, increment and sunk costs, capital rationing and rate of return.

**5.290 Independent Study in Industrial Engineering**

Prereq. Consent of Department Chairman; 1, 2, or 3 Q.H.

For students usually in the senior year with a high scholastic standing interested in independent study on advanced I.E. topics. Projects may be of an applied or theoretical nature; formal report submitted to student's project supervisor at end of quarter.

# Graphic Science Department

**Professor**

Wilfred P. Rule, B.S., M.S., Chairman

**Associate Professors**

Franklyn K. Brown, B.S., M.Ed.  
 Borah L. Kreimer, B.S., Ed.M.  
 Robert S. Lang, B.S., Ed.M.  
 Kenneth S. Woodward, B.S.

**Instructors**

E. Richard Artus, B.S.  
 Charles A. Garniewicz, B.S., M.S.  
 John P. Kopecki, B.S., M.Ed.  
 K. Endre Toth, S.B.  
 Melvin White, B.S.

**9.101 Graphic Science**

3 Cl.; 2 Lab.; 4 Q.H.

Space Geometry—Computer Programming: concepts involving the geometry of space relationships (points, lines, planes, and solids); development of basic computer programming language.

**9.102 Graphic Science**

2 Cl.; 2 Lab.; 3 Q.H.

Graphical-Mathematical Analysis, Computer Programming: graphical approach to concepts involving empirical equations, graphical calculus, vector quantities, nomography and equations of surfaces of revolution; the integration of computer programming and the graphical solution of engineering problems.

**9.103 Graphic Science**

2 Cl.; 2 Lab.; 3 Q.H.

Design Project Analysis: a synthesis of computer programming, space geometry and mathematical analysis leading to an understanding of applications in engineering design; development of student abilities in areas of original creative design.

**9.111 Introduction to Digital Computation**

1 Cl.; 0 Q.H.

This course demonstrates the methods and techniques of programming digital computers. Emphasis is on general programming principles which are applicable to the full spectrum of electronic digital computers. The student is taught a typical computer language called FORTRAN and is shown the capabilities of this language through the use of case studies. These case studies show the application of digital methods in the solution of scientific and engineering-oriented problems.

**9.112 Advanced Programming Principles**

1 Cl.; 0 Q.H.

Higher-level capabilities of the computer are developed by introducing more sophisticated aspects of the FORTRAN language. Computer logic and iterative procedures are emphasized through case studies that introduce the student to numerical methods.

**9.113 Engineering Applications and Numerical Methods**

1 Cl.; 1 Q.H.

The more prominent numerical methods and mathematics associated with digital computation are explored and applied to solve engineering problems. Professionally written programs are reviewed as case studies to demonstrate advanced techniques. Programs available as Library Subprograms (Scientific Programming Package) are reviewed.

<b>9.122 Cartography</b>	4 Cl.; 4 Q.H.
Methods and principles of map making, including the historical, cultural, sociological, economic and geographical implications of cartography.	
<b>9.124 Chart Analysis</b>	4 Cl.; 4 Q.H.
Evaluations and calculations from available data through the analysis of charts and graphs.	
<b>9.126 Elements — Nomography</b>	4 Cl.; 4 Q.H.
Graphical solutions designed to fit specific equations.	
<b>9.128 Methods in Illustration</b>	4 Cl.; 4 Q.H.
Application of illustration techniques, involving various media and graphic methods of communication. Designed for students majoring in the Arts, Sciences, and Education. Drawing skills not required.	

## Mathematics Department

### Professors

Harold L. Stubbs, Chairman,  
A.B., M.A., Ph.D.  
Edward M. Cook, A.B., M.A.  
Daniel Gorenstein, A.B., M.A., Ph.D.  
Arshag B. Hajian, M.S., Ph.D.  
Valentin A. Poenaru, Dipl.M., D.Sc.  
Flavio B. Reis, B.S., M.S., Ph.D.  
Giuliano Sorani, Laurea in  
Mathematics  
Jack Warga, B.A., Ph.D.

### Visiting Professor

Barry C. Mazur, Ph.D.

### Associate Professors

Roger M. Antoine, B.S., M.A.  
Shirley A. Blackett, A.B., M.Ed.  
Robert A. Bonic, M.S., Ph.D.  
Edward J. Booth, A.B., Ed.M.  
Warren C. Dean, A.B., M.A.  
Horace L. de Rivera, B.S., M.A.  
Ellen H. Dunlap, B.A.  
David I. Epstein, A.B., M.S., Ph.D.  
Holland C. Filgo, Jr., B.S., M.A., Ph.D.

### Associate Professors (continued)

Alberto R. Galmarino, A.B., Ph.D.  
Samuel M. Giveen, A.B., M.A.  
Robert D. Klein, B.S., M.S.  
Norman S. McCallister, A.B., Ed.M.  
Francis B. Shepardson, B.A., M.Ed.  
Victor R. Staknis, B.S., A.M., Ph.D.

### Visiting Associate Professor

Jonathan L. Alperin, A.B., A.M., Ph.D.

### Assistant Professors

Arienne S. Balser, B.A.  
Jacob Barshay, A.B., M.A., Ph.D.  
Bruce B. Claflin, A.B., M.S.  
John Frampton, B.S., M.S., Ph.D.

### Instructors

Samuel J. Blank, B.A., Ph.D.  
Mark Bridger, B.A., M.A.  
Tamar Burak, M.Sc.  
Maurice E. Gilmore, A.B., M.S., Ph.D.  
Betty Yuen-Tching Lou, B.A., M.A.  
Richard A. Rasala, A.B., A.M.

### 10.101 Basic Mathematics

3 Cl.; 3 Q.H.

For freshmen who are not prepared to begin calculus. Elementary logic, introduction to the algebra of sets, and the axiomatic use of basic mathematical concepts in the development of the real and complex number systems.

**10.102 Basic Mathematics** Prereq. 10.101; 3 Cl.; 3 Q.H.  
Functions and graphs, solution of linear, quadratic, and simultaneous equations; introduction to probability and statistics.

**10.103 Basic Mathematics** Prereq. 10.102; 3 Cl.; 3 Q.H.  
Fundamentals of trigonometry and analytic geometry; an introduction to differential calculus.

**10.104 Fundamentals of Mathematics** Prereq. 1 unit high-school algebra; 4 Cl.; 4 Q.H.  
For upper-class Business Administration and non-science Liberal Arts students. Basic algebraic principles; solutions of linear, quadratic, and simultaneous equations; exponents, radicals, and logarithms; functions and graphs; permutations and combinations; selected topics in probability.

**10.105 Fundamentals of Mathematics** Prereq. 10.104; 4 Cl.; 4 Q.H.  
Selected topics of analytic geometry; geometric interpretation of a derivative; derivatives of polynomials; product, quotient, and chain rules; applications of derivatives to curve sketching, maximum and minimum, and rate problems.

**10.106 Calculus** Prereq. 10.105 or 10.103; 4 Cl.; 4 Q.H.  
For upper-class students who have not had a previous course in calculus. Differential calculus for functions of one variable; topics in analytic geometry.

**10.107 Calculus** Prereq. 10.106; 4 Cl.; 4 Q.H.  
Integral calculus for functions of one variable; brief introduction to differential equations.

**10.111 Calculus** Prereq. 3½ units coll. prep. math.; 3 Cl.; 3 Q.H.  
A first course in calculus for freshmen majoring in Chemistry, Biological Sciences, and Pharmacy. Inequalities; functions, limits, particularly the derivative and the definite integral; Rolle's theorem and the mean-value theorem.

**10.112 Calculus** Prereq. 10.111; 3 Cl.; 3 Q.H.  
Differentiation and integration of algebraic functions with applications; topics in analytic geometry, including conic sections.

**10.113 Calculus** Prereq. 10.112; 3 Cl.; 3 Q.H.  
Transcendental functions and their derivatives and integrals; parametric functions; polar coordinates; vectors in a plane.

**10.141 Calculus** Prereq. 3½ units coll. prep. math.; 4 Cl.; 4 Q.H.  
A first course in calculus for freshmen in the College of Engineering. Introduction to analytic geometry, and to the differential and integral calculus of algebraic functions; inequalities, functions, and graphs; limits and continuity; mean-value theorem and applications.

**10.142 Calculus**

Prereq. 10.141; 4 Cl.; 4 Q.H.

Differential calculus applied to maximum-minimum and rate problems; the differential; the definite integral and areas; the indefinite integral; circles and conics.

**10.143 Calculus**

Prereq. 10.142; 4 Cl.; 4 Q.H.

The differential and integral calculus of transcendental functions; parametric equations; polar coordinates; vector algebra and differentiation; techniques of integration with geometric applications.

**10.144 Calculus**

Prereq. 10.143; 4 Cl.; 4 Q.H.

Solid analytic geometry and vectors; elements of infinite series including Taylor's theorem; partial derivatives, gradient, total differential, line integrals.

**10.145 Calculus**

Prereq. 10.144; 4 Cl.; 4 Q.H.

Multiple integration; linear algebra and vector spaces; eigen value problems; complex vector spaces; advanced topics in infinite series.

**10.146 Mathematical Analysis**

Prereq. 10.145; 3 Cl.; 3 Q.H.

Introduction to numerical methods for engineering problems, employing the electronic computer in root-evaluation, interpolation, and integration; introduction to differential equations with analytic and numerical solutions.

**10.147 Mathematical Analysis**

Prereq. 10.146; 3 Cl.; 3 Q.H.

Series solutions of different equations; Fournier series and orthogonal functions; introduction to partial differential equations, boundary-value problems and Sturm-Liouville systems.

**10.170 Geometry**

Prereq. 10.107, 10.113, or 10.202; 4 Cl.; 4 Q.H.

Selected topics from advanced plane Euclidean geometry, such as collinear points, concurrent lines, duality, cross-ratio, harmonic division of segments, homogeneous coordinates, abridged notations, special theorems concerning points, lines, triangles, and circles (Euler, Desargues, Lemoine, Brocard, Brianchon, Feuerbach); the nine point circle, inversion, reciprocation.

**10.171 Geometry**

Prereq. 10.170; 4 Cl.; 4 Q.H.

Discussion of Euclid's definitions and postulates; examination in detail of the Fifth Postulate and other items leading to Non-Euclidean Geometry; some special topics in Non-Euclidean Geometry of the hyperbolic and elliptic planes.

**10.195 Honors Calculus**

Prereq. Advanced Placement; 2 Cl.; 3 Q.H.

**10.201 Calculus**

5 Cl.; 5 Q.H.

A first course in calculus for freshmen majoring in Mathematics or Physics. Axioms for the real number system; the definite integral and its properties; the derivative, limits, continuity, and the algebra of derivatives.

**10.202 Calculus**

Prereq. 10.201; 5 Cl.; 5 Q.H.

Differentiation and integration of transcendental functions; techniques of integration; introduction to differential equations; vector algebra with

geometric applications; circles and conics; geometry of space curves; polar coordinates; mean-value theorem.

**10.203 Algebra** Prereq. 10.202 or equivalent; 5 Cl.; 5 Q.H.

Elementary linear algebra; vectors in 2 and 3 dimensions; linear transformations and matrices; n-dimensional vector spaces over real numbers; systems of linear equations; determinants; characteristic values; orthogonality.

**10.204 Calculus** Prereq. 10.202 and 10.203 or equivalents; 4 Cl.; 4 Q.H.

Extremum problems and indeterminate forms; sequences and series; Taylor's theorem; set functions; multiple integration.

**10.205 Calculus** Prereq. 10.204; 4 Cl.; 4 Q.H.

Partial differentiation; vector calculus; line and surface integrals; Green's and Stokes' theorems.

**10.206 Algebra** Prereq. 10.203; 4 Cl.; 4 Q.H.

Fundamentals of modern algebra. Mathematical induction; equivalence relations; groups; subgroups; cyclic groups; homomorphism; rings; ideals; polynomial rings; integral domains; congruences; fields.

**10.207 Differential Equations** Prereq. 10.204; 4 Cl.; 4 Q.H.

Solution of elementary ordinary differential equations; first order equations; higher order linear equations; series solutions.

**10.208 Probability** Prereq. 10.204; 4 Cl.; 4 Q.H.

Probability functions for finite and infinite sample spaces; conditional probability and independence; discrete and continuous probability distributions for one or more random variables; expectation; moments; moment-generating functions; central limit theorem.

**10.220 Mathematical Statistics** Prereq. 10.208; 4 Cl.; 4 Q.H.

Estimation of parameters; confidence intervals; hypothesis testing; regression; sampling distributions; introduction to analysis of variance and statistical decision theory.

**10.221 Applied Analysis** Prereq. 10.203, 10.207, 10.252; 4 Cl.; 4 Q.H.

First and second order ordinary differential equations; systems of linear differential equations; the Laplace transform.

**10.222 Applied Analysis** Prereq. 10.221; 4 Cl.; 4 Q.H.

Fourier series, series of orthogonal functions; Sturm-Liouville systems; boundary value and initial value problems in partial differential equations; integral equations.

**10.223 Numerical Analysis** Prereq. 10.203, 10.252, 10.220; 4 Cl.; 4 Q.H.

Solution of nonlinear equations and systems of linear and nonlinear equations; approximation; interpolation; smoothing; numerical integration and differentiation.

**10.224 Numerical Analysis** Prereq. 10.223; 4 Cl.; 4 Q.H.  
 Numerical solution of ordinary differential equations; accuracy and stability; numerical solution of boundary value and initial value problems in partial differential equations and integral equations.

**10.225 Computers and Logic** Prereq. 10.205 or equivalent; 4 Cl.; 4 Q.H.  
 Introduction to computer programming, FORTRAN; machine languages; Boolean algebra and logical design; Turing machines; automata.

**10.230 Linear Programming and Game Theory**  
 Prereq. 1 year college math; 4 Cl.; 4 Q.H.  
 Introduction to linear programming, game theory, and linear economic models.

**10.251 Analysis** Prereq. 10.205, 20.203; 4 Cl.; 4 Q.H.  
 Properties of real and complex numbers; set theory; metric spaces; compactness; uniform continuity; Riemann and Stieltjes integral.

**10.252 Analysis** Prereq. 10.251; 4 Cl.; 4 Q.H.  
 Sequences and series of functions; uniform convergence; termwise differentiation and integration; functions of several variables; implicit function theorem; change of variables.

**10.253 Analysis** Prereq. 10.252; 4 Cl.; 4 Q.H.  
 Fourier series and orthogonal functions; completeness; function spaces; special functions.

**10.254 Algebra** Prereq. 10.206 or equivalent; 4 Cl.; 4 Q.H.  
 Theory of groups and rings; factor groups; isomorphism theorems; Sylow theorems; direct products; Euclidean rings; modules; quotient fields.

**10.255 Algebra** Prereq. 10.254; 4 Cl.; 4 Q.H.  
 Vector spaces and linear transformations: bases; inner product spaces; orthogonal and normal matrices; quadratic forms, equivalence; similarity and canonical forms for matrices.

**10.256 Algebra** Prereq. 10.225; 4 Cl.; 4 Q.H.  
 Theory of fields: field extensions; automorphisms; Galois theory; applications to theory of equations.

**10.261 Projective Geometry** Prereq. 10.205, 10.206; 4 Cl.; 4 Q.H.  
 Analytic and synthetic projective geometry. Coordinatization of the Desarguean plane; collineation groups; n-dimensional projective space.

**10.262 Differential Geometry** Prereq. 10.205, 10.206; 4 Cl.; 4 Q.H.  
 Curves in space; properties of surfaces; differentiable manifolds; tangent spaces; curvature.

**10.271 Foundations of Mathematics** Prereq. 10.252, 10.206; 4 Cl.; 4 Q.H.  
 Logic; sets and relations; axiom of choice; cardinal and ordinal numbers.

**10.272 Foundations of Mathematics** Prereq. 10.271; 4 Cl.; 4 Q.H.  
 Properties of axiomatic systems; the real number system and other abstract spaces.

**10.273 History of Mathematics** Prereq. 10.205, 10.206; 4 Cl.; 4 Q.H.  
 Development of the various branches of mathematics; lives of outstanding mathematicians; growth of mathematical knowledge and its relation to culture. (This course may not be used as one of the two mathematics electives required of the pure option.)

**10.274 Number Theory** Prereq. 10.205; 10.206; 4 Cl.; 4 Q.H.  
 The properties of positive integers; divisibility; congruences; quadratic residues; Diophantine equations.

**10.295, 10.296, 10.297, 10.298 Honors Program** (each) 1 Cl.; 4 Q.H.

## Physics Department

### Professors

Reginald G. Lacount, Chairman,  
 S.B., M.A., Ph.D.  
 Richard L. Arnowitt, B.S., M.S., Ph.D.  
 Marvin H. Friedman, B.S., Ph.D.  
 Walter Hauser, B.S., Ph.D.  
 Giovanni Lanza, Ph.D.  
 Elliot H. Lieb, B.S., Ph.D.  
 Bertram J. Malenka, A.B., A.M., Ph.D.  
 Carl A. Shiffman, B.Sc., Ph.D.  
 Thomas H. Wallace, B.S., M.A., Ph.D.  
 Roy Weinstein, S.B., Ph.D.

### Visiting Professor

Petros N. Argyres, A.B., M.A., Ph.D.

### Associate Professors

Ronald Aaron, A.B., Ph.D.  
 Jonas Alster, Ph.D.  
 Alan H. Cromer, B.S., Ph.D.  
 Marvin W. Gettner, B.S., Ph.D.  
 Michael G. Glaubman, M.S., Ph.D.  
 Richard E. Grojean, B.S., M.S.

### Associate Professors (continued)

Eugene J. Saletan, B.A., M.A., Ph.D.  
 Yogi N. Srivastava, B.Sc., M.Sc., Ph.D.  
 Michael T. Vaughn, A.B., Ph.D.

### Assistant Professors

Hans Von Briesen, B.S., Ph.D.  
 Hyman Goldberg, B.Sc., Ph.D.  
 Bernard Gottschalk, B.S., Ph.D.  
 Pram Nath, B.Sc., M.Sc., Ph.D.  
 James E. Neighbor, B.S., S.M., Ph.D.  
 Morton S. Weiss, B.S., Ph.D.  
 Yitzhak Y. Sharon, A.B., Ph.D.  
 Fa Yueh Wu, B.S., M.S., Ph.D.

### Visiting Assistant Professors

Donald H. Kobe, B.S., M.S., Ph.D.  
 Gerhard Lutz, B.S., M.S., Ph.D.

### Instructors

Lloyd C. Kannenberg, S.B., M.S., Ph.D.  
 Allan Widom, B.S.

**11.101 Physics** 3 Cl.; 3 Q.H.  
 Vector algebra; stable equilibrium of particles and rigid bodies; kinematics of particle motion; Newton's laws; laws of gravitation; projectile motion; circular motion.

**11.102 Physics** Prereq. 11.101; 3 Cl.; 3 Q.H.  
 Work; kinetic and potential energy; conservative forces; conservation laws for energy and momentum; elastic and inelastic collisions; rotational motion; moment of inertia; conservation of angular momentum; simple harmonic motion.

**11.103 Physics**

Prereq. 11.102; 3 Cl.; 3 Q.H.

Temperature; heat energy; heat capacity; mechanical equivalent of heat; wave motion; wave energy and momentum; wave velocity; Huygen's principle; reflection; boundary conditions; resonance; Doppler's effect; vibration of strings; damped oscillations.

**11.104 Physics**

Prereq. 11.103, 10.143; 3 Cl.; 3 Q.H.

Electric charge; electric field; Gauss' law; electric potential; capacitors and dielectrics; electric current; electric circuits; magnetic field; Ampere's law.

**11.105 Physics**

Prereq. 11.104; 3 Cl.; 3 Q.H.

Faraday's law; inductance; a-c circuits; electromagnetic waves; light; reflection; refraction; interference; diffraction; polarization.

**11.110 Physics Laboratory**

Prereq. 11.103; 3 Lab.; 1 Q.H.

Introduction to physical measurements; selected experiments from mechanics, thermodynamics, electricity.

**11.111 Physics Laboratory**

Prereq. 11.110; 3 Lab.; 1 Q.H.

Selected experiments from various fields of physics, including electromagnetism, optics, modern physics.

**11.120 Physics**

Prereq. 10.143; 4 Cl.; 4 Lab.; 5 Q.H.

Vector algebra; statics of particles and rigid bodies; kinematics of particle motion; Newton's laws; circular motion; conservation laws of energy and momentum; moment of inertia; simple harmonic motion; temperature; heat capacity; mechanical equivalent of heat; wave motion.

**11.121 Physics**

Prereq. 11.120; 10.113; 4 Cl.; 4 Lab.; 5 Q.H.

Electrostatics; Gauss' law; electric currents and circuits; magnetic field; Ampere's and Faraday's laws; a-c circuits; electromagnetic waves; reflection; refractions; interference; diffraction; polarization.

**11.130 General Physics**

Prereq. 10.103; 4 Cl.; 4 Q.H.

A survey of Newtonian mechanics; methods of measurement; laws of rectilinear motion; uniform motion; equations of equilibrium; mechanics of liquids. Lectures and demonstrations are coupled with problems solvable by algebraic or trigonometric methods only.

**11.131 General Physics**

Prereq. 11.130; 3 Cl.; 3 Lab.; 4 Q.H.

Wave motion, sound, heat, electricity and magnetism.

**11.132 General Physics**

Prereq. 11.131; 3 Cl.; 3 Lab.; 4 Q.H.

Optics, elementary modern physics.

**11.136 Basic Physics**

Prereq. 10.101; 3 Cl.; 3 Lab.; 4 Q.H.

Methods of measurement; rectilinear and curvilinear motion; Newton's Laws; wave motion and sound; some topics in heat and the mechanics of fluids.

<b>11.137 Basic Physics</b>	Prereq. 11.136; 3 Cl.; 3 Lab.; 4 Q.H.
Electricity and magnetism; introduction to direct and alternating current; introductory electronics; and certain topics in optics; some discussion of X radiation and elementary modern physics.	
<b>11.140 Solid State Electronics</b>	Prereq. 11.104, 10.205; 3 Cl.; 3 Q.H.
Introduction to the application of solid state to electronics; structure of the solid state, and electron emission.	
<b>11.151 Physics</b>	3 Cl.; 3 Q.H.
Vector algebra; stable equilibrium of particles and rigid bodies; kinematics of particle motion; Newton's laws; law of gravitation; projectile motion; circular motion.	
<b>11.152 Physics</b>	Prereq. 11.151; 3 Cl.; 3 Q.H.
Work; kinetic and potential energy; conservation forces; conservation laws for energy and momentum; elastic and inelastic collisions; rotational motion, moment of inertia; conservation of angular momentum; simple harmonic motion.	
<b>11.153 Physics</b>	Prereq. 11.152; 3 Cl.; 3 Q.H.
Temperature; heat energy; heat capacity; mechanical equivalent of heat; wave motion; wave energy and momentum; wave velocity; Huygen's principle; reflection; boundary conditions; resonance; Doppler's effect; vibrations of strings; damped oscillations.	
<b>11.154 Physics</b>	Prereq. 11.153, 10.203; 4 Cl.; 4 Q.H.
Electric charge; electric field; Gauss' law; electric potential; capacitors and dielectrics; electric current; electric circuits; magnetic field; Ampere's law.	
<b>11.155 Physics</b>	Prereq. 11.154; 4 Cl.; 4 Q.H.
Faraday's law; inductance; a-c circuits; electromagnetic waves; light; reflection; refraction; interference; diffraction; polarization.	
<b>11.161 Physics Laboratory</b>	*1 Cl.; *3 Lab.; 1 Q.H.
*Laboratory meets every other week for 3 hours with 1 hour recitation on alternate weeks.	
This is the first in a sequence of 5 laboratory courses designed as an introduction to physical measurements. This sequence consists of selected experiments from various fields of physics, including mechanics, electromagnetism, thermodynamics, and modern physics.	
<b>11.162 Physics Laboratory</b>	Prereq. 11.161; *1 Cl.; *3 Lab.; 1 Q.H.
*Laboratory meets every other week for 3 hours with 1 hour recitation on alternate weeks.	
Continuation of 11.161 with emphasis on mechanics.	
<b>11.163 Physics Laboratory</b>	Prereq. 11.162; *1 Cl.; *3 Lab.; 1 Q.H.
*Laboratory meets every other week for 3 hours with 1 hour recitation on alternate weeks.	
Continuation of 11.162 with emphasis on mechanics and thermodynamics.	

**11.164 Physics Laboratory** Prereq. 11.163; \*1 Cl.; \*3 Lab.; 1 Q.H.  
\*Laboratory meets every other week for 3 hours with 1 hour recitation on alternate weeks.  
Continuation of 11.163 with emphasis on electromagnetic theory.

**11.165 Physics Laboratory** Prereq. 11.164; \*1 Cl.; \*3 Lab.; 1 Q.H.  
\*Laboratory meets every other week for 3 hours with 1 hour recitation on alternate weeks.  
Continuation of 11.164 with emphasis on electromagnetic theory and modern physics.

**11.170 Survey of Contemporary Physics** Prereq. 11.152; 3 Cl.; 3 Q.H.  
A descriptive course in modern physics. Topics will include special relativity, the wave nature of matter, and elementary particles.

**11.200 Mechanics I** Prereq. 11.154, 10.205; 4 Cl.; 4 Q.H.  
Vector analysis; kinematics and dynamics of a particle; generalized coordinates and Lagrange's equations of motion; conservative forces; electrodynamics.

**11.201 Mechanics II** Prereq. 11.200; 4 Cl.; 4 Q.H.  
Central force field motion; scattering; kinematics and dynamics of a system of particles; conservation theorems; rigid body motion; Hamilton's equations of motion.

**11.210 Electricity and Magnetism I** Prereq. 11.154, 10.251; 3 Cl.; 3 Q.H.  
Electrostatics using vector calculus; potential theory in two and three dimensions; dielectrics.

**11.211 Electricity and Magnetism II** Prereq. 11.210, 10.207; 4 Cl.; 4 Q.H.  
Magnetostatics; magnetic materials; time-dependent circuits.

**11.212 Electricity and Magnetism III** Prereq. 11.211; 4 Cl.; 4 Q.H.  
Maxwell's equations; electromagnetic waves; interaction of charges and fields.

**11.220 Thermodynamics and Kinetic Theory** Prereq. 11.154, 10.205; 4 Cl.; 4 Q.H.  
Simple thermodynamic systems; basic concepts and postulates; entropy; equilibrium; reversibility and irreversibility; thermodynamic potentials; phase changes; application to various physical systems; elementary kinetic theory of molecules; Maxwell's distribution; transport processes.

**11.230 Modern Physics** Prereq. 10.205, 11.154; 4 Cl.; 4 Q.H.  
A review of experiments demonstrating the atomic nature of matter, properties of the electron, the nuclear atom; the breakdown of classical laws;

quantization of light energy and atomic excitation energy; the radiation paradox of atomic structure; the wave nature of matter; the Bohr-Sommerfeld atomic theory; the hydrogen spectrum; the periodic table; characteristic X-rays.

**11.240 Quantum I** Prereq. 11.230, 10.207; 4 Cl.; 4 Q.H.

Observations of macroscopic and microscopic bodies; the uncertainty principle; wave-particle duality; probability and probability amplitudes; Schrödinger wave theory; one-dimensional problems.

**11.241 Quantum II** Prereq. 11.240; 4 Cl.; 4 Q.H.

Discrete and continuous states; Schrödinger equation in 3 dimensions; angular momentum; general theory of quantum mechanics; applications.

**11.260 Wave Laboratory** Prereq. 11.154; 2 Cl.; 3 Lab.; 4 Q.H.

A general treatment of the problems of mechanical and electromagnetic radiation as wave phenomena; the differential wave equation and its application to selected topics; interference and diffraction theory from the standpoint of the Huygen's-Fresnel and Kirchoff formulations; selected experiments in acoustics, optics and microwaves to illustrate these problems.

**11.261 Experimental Laboratory** Prereq. 11.154, 11.170; 1 Cl.; 4 Lab.; 3 Q.H.

Atomic nature of matter, properties of the electron; relativity; vacuum systems; machine shop practice.

**11.262 Electronics Laboratory** Prereq. 11.261; 1 Cl.; 4 Lab.; 3 Q.H.

Electronic circuits; pulse techniques; logic circuits; the photomultiplier; atomic detectors.

**11.263 Modern Physics Laboratory** 11.262; 1 Cl.; 4 Lab.; 3 Q.H.

Compton effect; positron annihilation; the nuclear atom; atomic excitation by electrons; magnetic properties of the proton and electron; Zeeman effect; interaction of radiations and matter; Fermi levels in metal.

# Chemistry Department

**Professors**

Robert A. Shepard, Chairman,  
B.S., Ph.D.  
W. Fay Luder, A.B., Ph.D.  
Karl H. Weiss, B.S., Ph.D.  
Saverio Zuffanti, B.S., M.A.

**Associate Professors**

Fletcher S. Boig, S.B., M.S., Ed.M.  
William E. Cass, Ph.B., Ph.D.  
Michael J. Eitel, B.S., Ph.D.  
William F. Holton, B.S., M.S., Ph.D.  
David M. Howell, B.S., M.S., Ph.D.  
Conrad M. Jankowski, B.S., M.S., Ph.D.  
Elmer E. Jones, Ph.D., S.B., Ph.D.  
Barry L. Karger, S.B., Ph.D.  
Harold Naidus, A.B., M.S., Ph.D.

**Associate Professors (continued)**

John L. Roebber, A.B., Ph.D.  
Robert L. Stern, A.B., M.A., Ph.D.  
Alfred Viola, B.A., M.A., Ph.D.  
Robert N. Wiener, A.B., M.S., Ph.D.

**Assistant Professors**

Darryl D. DesMarteau, B.S., Ph.D.  
Joseph D. Gresser, B.S., Ph.D.  
Efthalia J. Spinos, B.S., M.S.

**Laboratory Supervisor**

Bernard J. Lemire, B.S.

**12.101 General Chemistry**

2 Cl.; 3 Lab.; 3 Q.H.

Introduction to the principles of chemistry, with emphasis on stoichiometry, ionic solutions and the inorganic chemistry of biological systems.

**12.102 General Chemistry**

Prereq. 12.101; 2 Cl.; 3 Lab.; 3 Q.H.

Introduction to organic chemistry with emphasis on compounds of biological significance.

**12.111 General Chemistry**

3 Cl.; 3 Q.H.

For engineering students only. Atomic structure; chemical bonding; chemical calculations; states of matter; kinetic theory; chemical equilibrium.

**12.112 General Chemistry**

Prereq. 12.111; 3 Cl.; 3 Q.H.

For engineering students only. Solutions; acids and bases; ionic equilibrium; oxidation-reduction; the representative elements, especially the elements of the 2nd period; organic chemistry; nuclear chemistry.

**12.113 General Chemistry**

Prereq. 12.112; 3 Cl.; 3 Q.H.

For non-chemical engineering students only. Electrochemistry; equilibrium and spontaneous reactions; chemical kinetics; topics in inorganic chemistry.

**12.116 General Chemistry**

Prereq. 12.112; 3 Cl.; 3 Lab.; 4 Q.H.

For chemical engineering students only. Qualitative analysis; electrochemistry; equilibrium and spontaneous reactions; chemical kinetics; topics in inorganic chemistry.

<b>12.121 General Chemistry</b>	3 Cl.; 3 Lab.; 4 Q.H.
For non-chemistry majors only. Atomic structure and periodicity; chemical bonding; stoichiometry; solutions; states of matter; chemical equilibrium; laboratory experiments illustrating above principles.	
<b>12.122 General Chemistry</b>	Prereq. 12.121; 3 Cl.; 3 Lab.; 4 Q.H.
For non-chemistry majors only. Acids and bases; ionic equilibrium; oxidation-reduction; chemistry of the representative elements; organic compounds; nuclear chemistry.	
<b>12.123 General Chemistry</b>	Prereq. 12.122; 3 Cl.; 3 Lab.; 4 Q.H.
For non-chemistry majors only. Introduction to qualitative analysis; electrochemistry; equilibrium and spontaneous reactions; chemical kinetics; topics in inorganic chemistry. Laboratory: the detection of metal ions in solution.	
<b>12.131 General Chemistry</b>	3 Cl.; 3 Lab.; 4 Q.H.
For chemistry majors and selected biology majors. Stoichiometry; atomic structure; chemical bonding; solutions; states of matter; chemical equilibrium; acids and bases. Laboratory: introduction to quantitative analysis.	
<b>12.132 General Chemistry</b>	Prereq. 12.131; 3 Cl.; 3 Lab.; 4 Q.H.
For chemistry majors and selected biology majors. Solutions of electrolytes; ionic equilibrium; oxidation-reduction; electrochemistry; equilibrium and spontaneous reactions; chemistry of the representative elements. Laboratory: quantitative analysis.	
<b>12.133 General Chemistry</b>	Prereq. 12.132; 3 Cl.; 6 Lab.; 5 Q.H.
For chemistry majors and selected biology majors. Principles of qualitative analysis; hydroxylic acids and their derivatives; chemical kinetics; related metals; coordination compounds; nuclear chemistry; introduction to organic chemistry. Laboratory: semimicro qualitative analysis.	
<b>12.135 General Chemistry</b>	3 Cl.; 3 Lab.; 4 Q.H.
Atomic structure; chemical bonding; states of matter; solutions; chemical equilibrium; electrolytes; electrochemistry; ionic equilibrium. Laboratory experiments illustrating these principles.	
<b>12.136 General Chemistry</b>	Prereq. 12.135; 3 Cl.; 3 Lab.; 4 Q.H.
Nuclear chemistry; periodic properties of the representative elements; related metals; coordination compounds; introduction to organic structures; introduction to chemical analysis. Laboratory experiments illustrating these principles.	
<b>12.141 Organic Chemistry</b>	Prereq. 12.123 or 12.133 or 12.136; 3 Cl.; 3 Lab.; 4 Q.H.
Molecular structure; nomenclature; properties; reactions of aliphatic, alicyclic, and aromatic hydrocarbons.	

<b>12.142 Organic Chemistry</b>	Prereq. 12.141; 3 Cl.; 3 Lab.; 4 Q.H.
Monofunctional compounds; nomenclature, preparation, properties, and reactions of alcohols, halides, ethers, aldehydes, ketones, amines and carboxylic acids and their derivatives, with some attention to biological significance.	
<b>12.143 Organic Chemistry</b>	Prereq. 12.142; 3 Cl.; 3 Lab.; 4 Q.H.
Polyfunctional compounds; glycols, substituted acids, carbohydrates, amino acids, proteins, and heterocyclic compounds; with special emphasis on biological significance.	
<b>12.147 Organic Chemistry</b>	Prereq. 12.116; 4 Cl.; 3 Lab.; 5 Q.H.
Aliphatic compounds; preparation, properties, and reactions of the more common classes of open-chain compounds; electronic interpretation of structures and reactions; petrochemicals; synthetic resins; carbohydrates; fats; proteins.	
<b>12.148 Organic Chemistry</b>	Prereq. 12.147; 4 Cl.; 3 Lab.; 5 Q.H.
Aromatic compounds: preparation, properties, and reactions of the more common classes of aromatic compounds; electronic interpretation of structures and reactions of aromatic compounds; dyes, commercial solvents, and important industrial products. A brief introduction to alicyclic and heterocyclic compounds.	
<b>12.153 Organic Chemistry</b>	Prereq. 12.133; 3 Cl.; 3 Lab.; 4 Q.H.
Syntheses and properties of aliphatic and aromatic hydrocarbons and their functional derivatives; correlation between the structure of organic compounds and their physical and chemical properties; electronic interpretation of organic reactions.	
<b>12.154 Organic Chemistry</b>	Prereq. 12.153; 3 Cl.; 3 Lab.; 4 Q.H.
Continuation of 12.153.	
<b>12.155 Organic Chemistry</b>	Prereq. 12.154; 3 Cl.; 6 Lab.; 5 Q.H.
Continuation of 12.154.	
<b>12.161 Physical Chemistry</b>	Prereq. 12.148 or 12.154; 4 Cl.; 3 Lab.; 5 Q.H.
Chemical thermodynamics: first and second laws; phase equilibria; solutions.	
<b>12.162 Physical Chemistry</b>	Prereq. 12.161; 4 Cl.; 3 Lab.; 5 Q.H.
Kinetic theory of gases; chemical kinetics; electrochemistry: conductance and ionic reactions, electrochemical cells.	
<b>12.163 Physical Chemistry</b>	Prereq. 12.162; 3 Cl.; 3 Lab.; 4 Q.H.
Quantum chemistry: particles and waves; Schroedinger wave mechanics; the chemical bond.	

<b>12.171 Analytical Chemistry</b>	Prereq. 12.143; 3 Cl.; 3 Lab.; 4 Q.H. The principles and practice of inorganic quantitative analysis and the applications of gravimetric and volumetric methods of analysis. Laboratory analyses of samples.
<b>12.174 Analytical Chemistry</b>	Prereq. 12.143; 4 Cl.; 4 Lab.; 5 Q.H. The principles and practice of inorganic quantitative analysis; solution calculations and interpretation of results; the theory and application of volumetric and gravimetric methods of analysis. Laboratory analyses of samples.
<b>12.176 Analytical Chemistry</b>	Prereq. 12.161; 4 Cl.; 4 Q.H. Fundamental principles of classical analytical chemistry; the theory of modern applications of gravimetric and volumetric methods of analysis.
<b>12.177 Analytical Chemistry</b>	Prereq. 12.176; 3 Cl.; 6 Lab.; 5 Q.H. The principles and practice of instrumental methods of analysis. Laboratory analysis of samples.
<b>12.178 Analytical Chemistry</b>	Prereq. 12.177; 1 Cl.; 6 Lab.; 3 Q.H. Interpretation of analytical results. Laboratory analysis of samples.
<b>12.182 Chemical Literature</b>	Prereq. 12.163; 2 Cl.; 2 Q.H. Uses of abstracting journals; types and sources of publications; patents as sources of information; sources of financial, statistical, and industrial information. Preparation of a detailed bibliography on an original topic. Preparation of written progress reports, typical research reports, etc.
<b>12.184 Biochemistry</b>	Prereq. 12.143 or 12.148 or 12.155; 4 Cl.; 4 Q.H. The cell and its constituents; the properties of enzymes and the nature of the catalytic process; metabolism of carbohydrates, fats, and proteins.
<b>12.211 Advanced Inorganic Chemistry</b>	Prereq. 12.163; 2 Cl.; 2 Q.H. Advanced treatment of the chemistry of transition metals; acid and base behavior; the significance of nuclear properties, nuclear changes and tracer studies in inorganic chemistry.
<b>12.212 Advanced Inorganic Chemistry</b>	Prereq. 12.211; 2 Cl.; 2 Q.H. Characteristics of atoms and molecules based on their electronic structure and the periodic classification of elements; structure of crystals; electrostatic complexes; advanced chemistry of lighter elements.
<b>12.251 Advanced Organic Chemistry</b>	Prereq. 12.155; 4 Cl.; 4 Q.H. Nomenclature of organic compounds; synthetic resins; directional enolization; acidic and basic catalyzed reaction mechanisms; scope of the Diels-Alder diene synthesis; terpenes; heterocyclic chemistry.

**12.253 Identification of Organic Compounds**

Prereq. 12.155; 1 Cl.; 6 Lab.; 3 Q.H.

Qualitative analysis of organic compounds having one or two functional groups. Single liquids, single solids, liquid mixtures, solid mixtures, and some industrial products are analyzed.

**12.261 Advanced Physical Chemistry**

Prereq. 12.163; 4 Cl.; 4 Q.H.

Molecular structure and spectra; introduction to statistical thermodynamics; states of matter.

**12.281 Senior Research**

Prereq. 12.178 and 12.182; 9 Lab.; 3 Q.H.

Original experimental work under direction of a staff member. Approval of department head necessary.

**12.282 Senior Research**

Prereq. 12.281; 6 Lab.; 2 Q.H.

Continuation of 12.281, culminating in a research report on the year's work.

**12.284 Advanced Chemical Synthesis**

Prereq. 12.155; 9 Lab.; 3 Q.H.

Special projects in the synthesis of organic and/or inorganic compounds, using advanced techniques.

**12.286 Advanced Chemical Measurements**

Prereq. 12.163 and 12.178; 9 Lab.; 3 Q.H.

Laboratory problems in analytical and/or physical chemistry.

**12.288 Special Topics**

Prereq. 12.163; 4 Cl.; 4 Q.H.

Selected topics of current importance in the growth of chemistry.

**12.291, 12.292, 12.293, 12.294 Honors Program**

(each) 4 Q.H.

Directed study and/or experimental research. See page 101.

# Earth Sciences Department

**Associate Professors**

J. Rosson Overcash, Chairman,  
B.A., A.M.T.  
David L. Wilmarth, B.S., Ed.M.

**Assistant Professors**

Bernard L. Gordon, B.S., M.S.  
A. William Kochanczyk, B.S., M.Ed  
Richard D. Ruggles, A.B., A.M.

**Instructors**

Cleveland O. Clarke, B.S., M.Ed.  
William T. Harty, B.S., M.Ed.  
Charles E. McClennen, B.A., M.A.T.  
Lillian Morgenstern, A.B., A.M.  
Joseph F. Walsh, B.S., M.Ed.

**16.106 Introduction to Earth Science I**

3 Cl.; 3 Q.H.

The geological characteristics of the immediate environment are elaborated upon, until an extensive classified list reveals the fundamental forces and factors causing topographical change. Several of these factors are examined in detail. Two major interpretations of these changes result: 1) the probable internal structure of the earth; 2) their significance for the age of the earth and its historical development.

**16.107 Introduction to Earth Science II**

3 Cl.; 3 Q.H.

The characteristics of the ocean as a special topographical feature leads to a study of the physical and biological significance of this realm of our total environment.

The common factor of the atmosphere and its interrelationships to the surface of the earth are established. Weather phenomena and climate patterns complete the study of our earth as a body in space.

**16.108 Introduction to Earth Science III**

3 Cl.; 3 Q.H.

The earth serves as a point from which observations can be made of the entire universe. The common illusionary behaviors are examined to determine the heliocentric organization and resultant behaviors of our earth, the accompanying solar system components, and their relationship to the stellar background.

An analysis of the Milky Way galaxy provides a basis for the introduction of theories of cosmology. The realistic probabilities of human space exploration are considered.

**16.111 Earth Sciences I**

4 Cl.; 4 Q.H.

Not open to students who have taken 16.106, 16.107, or 16.108. An introduction to the geological and oceanological characteristics of the earth. Topographical features are identified; the forces that produce change are examined and the interrelationships are analyzed. Practical applications and field experience are employed whenever feasible.

**16.112 Earth Sciences II**

4 Cl.; 4 Q.H.

Not open to students who have taken 16.106, 16.107, or 16.108. The features and forces of weather and climate are studied with emphasis on

their immediate significance to an individual devoted to extensive out-of-door activities. Weather signs, weather patterns and forecasting are of primary concern. The earth as a body in space is related to the remainder of the universe. Field observations and interpretations are made of the earth-universe relationships. The particular behaviors of the solar system components are identified. The celestial features are discussed to establish a conceptual image of the Milky Way galaxy. Stellar evolution and its significance for cosmology serves to unify the study of the earth in space.

**16.121 Introduction to Natural History I**

4 Cl.; 4 Q.H.

The identifying characteristics, life history, ecological relationships and economic importance of the invertebrates, amphibians and reptiles; special attention to the animals and plants found in the tidal zone along the coast; rocks and minerals common to the New England area.

**16.122 Introduction to Natural History II**

4 Cl.; 4 Q.H.

A brief study of fish, birds, and mammals completes the animal kingdom. The algae, fungi, mosses, ferns and higher plants are treated in the same manner as were the animals.

**16.125 Conservation of Natural Resources**

4 Cl.; 4 Q.H.

Problems relating to the use and preservation of the resources of water, soil, forests and wildlife; non-renewable mineral resources, particularly the mineral fuels.

**16.131 Oceanography I**

4 Cl.; 4 Q.H.

An introduction to the geology of the ocean basins, and the physical and chemical properties of sea water; the development of ocean currents and the important effects these currents have on the land masses of the world.

**16.132 Oceanography II**

4 Cl.; 4 Q.H.

Animal and plant life in the various zones of the ocean; the growing economic importance of the oceans as a source of food for the expanding world population.

**16.135 Geology of New England**

Prereq. 16.131; 4 Cl.; 4 Q.H.

A systematic study of significant topographic features of New England and the geological forces and processes involved in their formation. Included for study will be the Boston Basin, the Connecticut River Valley, New England coastal features, the White and Green Mountains.

**16.141 Principles of Geology**

4 Cl.; 4 Q.H.

An introduction to the kinds of evidence on which our present understanding of geology is based. While some consideration will be given to rock classification and landscape morphology, this will be subordinate to a consideration of the physical and chemical forces which interact to form and shape the earth.

**16.142 Historical Geology**

4 Cl.; 4 Q.H.

The factors that serve the geologist in determining the history of a land mass, and the extent to which these factors have been and can be applied

in the field; Eras and Periods currently identified with specific reference to the environment that characterized the times, and the forces that provoked the development, persistence, and termination of each time unit.

**16.151 History of Science and Technology I** 4 Cl.; 4 Q.H.

Some of the major developments in science and technology from the time of prehistoric man to the period of the Renaissance; the origin and developments of tools, weapons, writing, mathematics, medicine and astronomy. Particular emphasis will be placed upon the interactions between science, technology and society.

**16.152 History of Science and Technology II** 4 Cl.; 4 Q.H.

The history of some of the major developments in science and technology from the time of the Renaissance to the present; special emphasis on the origin and development of the Newtonian influence; the limitations of the techniques of the 17th, 18th and 19th centuries as evidenced in contemporary society; the potentials for scientific and technological advancement.

**16.161 Observational Astronomy** 4 Cl.; 4 Q.H.

An introduction to the night sky as seen by the naked eye and with simple optical aids. The location and identification of constellations, major stars, planets, comets and meteors. Three telescopic viewing sessions will be held.

**16.162 Astronomy** 4 Cl.; 4 Q.H.

The principles and practices of modern astronomy are introduced through consideration of the solar system, Milky Way Galaxy, and the universe. This is done by study of the observational devices and data and their significance to cosmology.

**16.170 Engineering Geology** Prereq. 10.142; 4 Cl.; 4 Q.H.

Origin and composition of earth's crust — soil, rocks, clay and rock mineralogy, weathering, stream and shoreline problems, glaciers, earth movements, elements of hydrologic cycle, geological mapping and exploration.

**16.174 Geology** 2 Cl.; 2 Q.H.

For Part-Time Civil Engineering Program. Origin and composition of earth's crust — soil, rocks, clay and rock materials; weathering, stream and shoreline problems.

**16.175 Geology** Prereq. 1.174; 2 Cl.; 2 Q.H.

For Part-Time Civil Engineering Program. Glaciers, earth movements, elements of Hydrologic cycle, geological mapping and exploration.

# Biology Department

**Professors**

Francis D. Crisley, Chairman, B.S.,  
M.S., Ph.D.  
Fred A. Barkley, A.B., M.S., Ph.D.  
Charles Gainor, B.S., M.S., Ph.D.  
Charles M. Goolsby, B.S., M.S., Ph.D.  
Abdul Karim Khudairi, B.S., Ph.D.

**Associate Professors**

Janis Z. Gabliks, D.D.S., M.S., Ph.D.  
Fred A. Rosenberg, B.A., Ph.D.  
Henry O. Werntz, B.S., Ph.D.

**Assistant Professors**

David H. Ahlberg, A.B.  
Britta L. Karlsson, B.S., M.T. (ASCP)  
Patricia Morse, B.S., M.S.  
Samuel E. Moyer, B.S., M.S., Ph.D.  
Joseph V. Pearincott, B.S., M.S., Ph.D.

**Preparator**

Paul R. Larivee, B.S.

**Laboratory Supervisor**

Joseph A. Johnson, B.S.

**18.101 Elements of Biology**

2 Cl., 3 Lab.; 3 Q.H.

Basic principles of biology with emphasis upon animal biology.

**18.102 Elements of Biology**

Prereq. 18.101; 2 Cl.; 3 Lab.; 3 Q.H.

Continuation of 18.101.

**18.103 Introduction to Physiology**

3 Cl.; 3 Lab. 4 Q.H.

Non-biochemical physiology stressing function of animal systems.

**18.104 Physiology**

2 Cl.; 3 Lab.; 3 Q.H.

Principles of physiology.

**18.105 Physiology**

Prereq. 18.104; 2 Cl.; 3 Lab.; 3 Q.H.

Principles of physiology.

**18.107 Integrated Science**

4 Cl.; 3 Lab.; 4 Q.H.

Principles of chemistry; principles of biology.

**18.108 Integrated Science**

Prereq. 18.107; 4 Cl.; 3 Lab.; 4 Q.H.

Human anatomy and physiology.

**18.109 Integrated Science**

Prereq. 18.108; 4 Cl.; 3 Lab.; 4 Q.H.

Biology of micro-organisms; medical bacteriology including epidemiology; human parasitology.

**18.110 Microbiology**

2 Cl.; 3 Lab.; 3 Q.H.

Principles of bacteriology; medical microbiology and epidemiology.

**18.111 General Biology**

2 Cl.; 3 Lab.; 3 Q.H.

Introduction to essential concepts in the major areas of biology; physico-chemical background of biology; cell doctrine; analysis of structure, function and development in vertebrate animals.

<b>18.112 General Biology</b>	Prereq. 18.111; 2 Cl.; 3 Lab.; 3 Q.H. Analysis of structure, function and development in vascular plants; infra-cellular processes; diversity and adaptation in animals.
<b>18.113 General Biology</b>	Prereq. 18.112; 2 Cl.; 3 Lab.; 3 Q.H. Diversity and adaptation in plants; organisms in their environment; heredity; history and mechanism of evolution.
<b>18.116 Clinical Pathology</b>	Prereq. 18.113; 9 Cl.; 18 Lab.; 4 Q.H. Introduction to the methods, principles, and theories in clinical pathology and clinical research.
<b>18.118 Organic Evolution</b>	4 Cl.; 4 Q.H. The major features of organic evolution with emphasis on vertebrate evolution, genetics, and physical influences.
<b>18.120 Basic Microbiology</b>	3 Cl.; 4 Lab.; 4 Q.H. Microbial life, emphasizing morphological characteristics, physiological activities and disease production.
<b>18.125 Human Physiology</b>	Prereq. 18.129 or equiv.; 2 Cl.; 3 Lab.; 3 Q.H. Physical and biochemical activities of the cell; functions of blood and the circulatory systems; osmoregulation.
<b>18.126 Human Physiology</b>	Prereq. 18.125; 2 Cl.; 3 Lab.; 3 Q.H. Nerve and muscle function; digestion, respiration, internal secretion, and the physiology of sex and reproduction.
<b>18.127 Basic Animal Biology</b>	2 Cl.; 3 Lab.; 3 Q.H. Principles of biology and life as exemplified by the cell and protoplasm.
<b>18.128 Basic Animal Biology</b>	Prereq. 18.127; 2 Cl.; 3 Lab.; 3 Q.H. Organ systems and their functions.
<b>18.129 Basic Animal Biology</b>	Prereq 18.128; 2 Cl.; 3 Lab.; 3 Q.H. Embryology, genetics, and evolution of animals.
<b>18.130 Basic Botany</b>	3 Cl.; 6 Lab.; 5 Q.H. Major systematics, morphology, life histories, and physiology of the kingdom plantae.
<b>18.140 Haematology</b>	3 Cl.; 3 Lab.; 4 Q.H. The normal and pathologic morphology of the blood and blood-forming organs with emphasis on diagnosis and prognosis.
<b>18.148 Human Anatomy</b>	3 Cl.; 3 Lab.; 4 Q.H. The structure and development of the human body.

**18.150 Comparative Vertebrate Anatomy** Prereq. 18.113; 3 Cl.; 6 Lab.; 5 Q.H.  
Morphology and phylogeny of the vertebrates; laboratory studies on taxonomy of the group, and specific morphology of the dogfish shark and the cat.

**18.155 Developmental Anatomy** Prereq. 18.150; 3 Cl.; 6 Lab.; 5 Q.H.  
Emphasizes chick and pig in the laboratory.

**18.158 Vertebrate Physiology** Prereq. General Chem.; 3 Cl.; 3 Lab.; 4 Q.H.  
Properties of living protoplasm; the general organization and function of cells; translocation of materials and the organization of animals; the physiology of the skeletal systems of man and animals; the physiology of amoeboid, ciliary and contractile movement with emphasis on muscle metabolism; the structure and function of neurons, reflex arcs, the autonomic nervous system, and the sensory receptors.

**18.159 Vertebrate Physiology** Prereq. 18.158; 3 Cl.; 3 Lab.; 4 Q.H.  
Fluid media of animals, emphasizing water and electrolyte balance and kidney function in many; the physiology of blood, including its formation, functions, clotting, antigens and tests for identifying blood; the physiology of the heart, nervous control of the vascular system, breathing and gas transport, heat regulation, nutrition, digestion and assimilation; the endocrine secretions and the physiologic aspects of reproduction.

**18.200 Genetics** Prereq. 18.113; 3 Cl.; 3 Lab.; 4 Q.H.  
Fundamental principles of genetics.

**18.210 Invertebrate Zoology** Prereq. 18.113; 3 Cl.; 6 Lab.; 5 Q.H.  
The invertebrate animals exclusive of the protozoans and insects.

**18.225 Animal Histology** Prereq. 18.150; 2 Cl.; 3 Lab.; 3 Q.H.  
Microscopic study of fundamental types of animal tissues.

**18.226 Animal Histology** Prereq. 18.225; 2 Cl.; 3 Lab.; 3 Q.H.  
Continuation of 18.225. Microscopic anatomy of animal organs, primarily mammalian organs.

**18.228 Histological Technique** Prereq. 18.150; 1 Cl.; 6 Lab.; 3 Q.H.  
General methods of tissue preparation for purposes of microscopic study; preparation of solutions and stains; the microtome and its operation together with specific directions for fixation, clearing, hardening, embedding, section-cutting, and staining of tissues.

**18.240 Microbial Physiology** Prereq. 18.120; 3 Cl.; 4 Lab.; 5 Q.H.  
The biochemical changes brought about through microbial activities; measurement of metabolic biosynthesis and degradation, rates of reaction and determination of end products.

**18.258 Cellular and Comparative Physiology**

Prereq. 18.150, 12.143; 3 Cl.; 3 Lab.; 4 Q.H.

Biophysics and biochemistry of the cells and tissues of animals including biogenesis, cell parts and their function, membranes and osmotic regulation, metabolism and photosynthesis, comparative nutrition and excretion, and enzyme action. Laboratory emphasizes modern instrumentation, experimental data accumulation and scientific report writing.

**18.259 Cellular and Comparative Physiology**

Prereq. 18.258; 3 Cl.; 3 Lab.; 4 Q.H.

Nucleic acid and protein biosynthesis, information theory and coding; the physiology of collagen and bone; adaptive enzymes; form and function in muscles; amoeboid and ciliary movement; sensory and nervous electrophysiology.

**18.295, 18.296, 18.297, 18.298 Honors Program**

(each) 4 Q.H.

**Psychology Department****Professors**

A. Bertrand Warren, Chairman,  
A.B., M.A., Ph.D.

John C. Armington, B.S., M.S., Ph.D.

Warren H. Teichner, B.A., M.S., Ph.D.

Harold S. Zamansky, B.S., Ph.D.

**Assistant Professors**

Edward A. Arees, B.B.A., M.S., Ph.D.

Roger F. Brightbill, A.B., Ph.D.

Richard H. Lent, A.B., M.A., Ph.D.

Ina Samuels, Ph.B., B.A., M.A., Ph.D.

Dale R. Schissler, B.S., Ph.D.

**Associate Professors**

Charles Karis, A.B., A.M., Ph.D.

Helen S. Mahut, B.A., M.A., Ph.D.

Bertram Scharf, B.A., Ph.D.

**19.101 Introductory Psychology**

3 Cl.; 3 Q.H.

Psychological principles.

**19.102 Basic Psychology**

4 Cl.; 4 Q.H.

The basic principles of psychology.

**19.103 Principles of Psychology I**

3 Cl.; 3 Q.H.

The major fields of psychology; topics include maturation and growth, statistics, individual differences, and learning.

**19.104 Principles of Psychology II**

Prereq. 19.103; 3 Cl.; 3 Q.H.

Sensory bases of response, perception, motivation, emotions, and personality.

**19.105 Foundations of Psychology I**

4 Cl.; 4 Q.H.

Major concepts from most areas of psychological investigation; the experimental approach to the study of behavior including growth and development, individual differences, learning and social psychology.

**19.106 Foundations of Psychology II** Prereq. 19.105; 4 Cl.; 4 Q.H.  
The sensory bases of response, perception, motivation, emotions, personality, and behavioral disorders.

**19.120 Statistics in Psychology I** Prereq. 19.106; 4 Cl.; 4 Q.H.  
Measures of central tendency, variability, graphic presentation of data, standard scores, reliability and regression.

**19.121 Statistics in Psychology II** Prereq. 19.120; 4 Cl.; 4 Q.H.  
Probability; binomial and normal distributions; parametric and non-parametric tests of significance, including chi square, t-test, F-test, sign test; and introduction to analysis of variance.

**19.130 Social Psychology** Prereq. 19.106; 4 Cl.; 4 Q.H.  
The analysis of the individual's behavior in social contexts; topics considered include the historical development of social psychology, socialization, national character, ethnic and class structure, prejudice, attitudes and attitude measurement, propaganda, crowd behavior, group membership and structure, leadership, and social movements.

**19.135 Personality** Prereq. 19.106; 4 Cl.; 4 Q.H.  
Systematic study of the normal personality; a number of approaches to personality research including the Freudian, neo-Freudian, Lewinian, stimulus-response, factor analytic, and constitutional.

**19.140 Child and Adolescent Psychology** Prereq. 19.106 or 19.108 or 19.102; 4 Cl.; 4 Q.H.  
Exploration of the processes of growth and development from infancy through adolescence; developmental theories of Piaget and Erikson; genetics; maturation; intelligence; cognition; personality; language; social behavior; emotion; motivation; learning.

**19.146 Motivation** Prereq. 19.106 or 19.108; 4 Cl.; 4 Q.H.  
The various aspects of motivation; primary and secondary drives; unconscious motivation; effectence motivation; the assessment of motives.

**19.150 Perception** Prereq. 19.106 or 19.108; 4 Cl.; 4 Q.H.  
An introduction to the nature of the perceptual world; the nature of object recognition and identification, spatial organization, contextual effects, learning and perception, and the influence of attitudinal, motivational, and personality factors on perception.

**19.155 Psychology of Language and Thought** Prereq. 19.106 or 19.108; 4 Cl.; 4 Q.H.  
Recent research in psycholinguistics and cognitive psychology will be reviewed. Topics will include the acquisition of language, verbal habits, the measurement of meaning, cultural determinants of linguistic behavior, problem solving and creativity, and concept attainment.

**19.160 Experimental Psychology I** Prereq. 19.121; 3 Cl.; 3 Lab. 4 Q.H.  
Concentration upon the experimental method in the design, execution, analy-

sis and reportings of psychological investigations. Laboratory experiments in the area of general experimental psychology.

**19.161 Experimental Psychology II** Prereq. 19.160; 3 Cl.; 3 Lab.; 4 Q.H.

A systematic analysis of methods in the investigation of basic animal and human learning processes; emphasis on experimental procedures, research findings, and theoretical interpretations; experiments on animal and human subjects.

**19.162 Experimental Psychology III** Prereq. 19.161; 3 Cl.; 3 Lab.; 4 Q.H.

Structural and behavioral analysis of the sense organs; experimental methods, research findings and theoretical implications in the investigation of vision, audition, olfaction, gustation and the skin senses.

**19.180 Physiological Psychology I** Prereq. 19.108 or 19.106; 4 Cl.; 4 Q.H.

Evolution of the nervous system; neural transmission; neurophysiology of the reticular formation, cortex, motor systems, skin senses, vision and audition.

**19.181 Physiological Psychology II** Prereq. 19.180; 4 Cl.; 4 Q.H.

Neural mechanisms of motivation and emotion, sleep, attention, perception, learning and memory.

**19.201 Psychology of Abnormal Behavior** Prereq. 19.140; 4 Cl.; 4 Q.H.

The symptomatology, etiology, dynamics, and therapy of the abnormal personality; the basic varieties of neurosis and psychosis; somatic therapies and fundamental varieties of psychotherapy.

**19.202 Abnormal Psychology I** Prereq. 2 yrs. psych.; 4 Cl.; 4 Q.H.

The abnormal personality; historical background; criteria of abnormality. Theoretical framework of normal and abnormal development; anxiety and defense; etiology, dynamics, and symptomatology of the neuroses.

**19.203 Abnormal Psychology II** Prereq. 19.202; 4 Cl.; 4 Q.H.

Psychotherapy; etiology, dynamics, and symptomatology of the psychoses; psychosomatic, sociopathic, and organic disorders; somatic therapies; socio-cultural aspects.

**19.210 History of Psychology** Prereq. 2 yrs. psych.; 4 Cl., 4 Q.H.

Evaluation of modern psychology in the light of its historical origins.

**19.211 Systems of Psychology** Prereq. 19.210; 4 Cl.; 4 Q.H.

Major schools of psychology which have influenced the development of modern psychology and contemporary systematic trends.

**19.220 Psychological Testing** Prereq. 19.120; 4 Cl.; 4 Q.H.

Basic principles of test theory, test administration, and test construction; familiarization with representative types of tests.

**19.240 Industrial Psychology** Prereq. 19.106 or 19.108; 3 Cl.; 3 Q.H.  
 Motivation of workers; employee attitudes and morale; industrial mental health; counseling; interviewing; personnel selection; psychological tests in industry; leadership; group decision methods; the optimal working environment.

**19.295, 19.296, 19.297, 19.298 Honors Program**

(each) 4 Q.H.

## Sociology and Anthropology Department

### Professors

Frank F. Lee, Chairman,  
 B.A., M.A., Ph.D.

Stephen Schafer, D.Jur., Prof. Agregé

### Associate Professors

Rose L. Coser, B.A., M.A., Ph.D.

Theodore N. Ferdinand,  
 B.S., M.S., Ph.D.

Morris Freilich, B.A., Ph.D.

Morton Rubin, B.A., M.A., Ph.D.

### Assistant Professors

William J. Bowers, A.B., Ph.D.

John D. A. Ferguson, B.A., M.A., Ph.D.

Elliot A. Krause, B.A., M.A., Ph.D.

Masri Singarimbun, B.A., Ph.D.

Robert S. Weppner, B.S., M.S.

### Instructors

Sarah W. Lockeretz, B.A.

Nathaniel Raymond, B.A., M.A.

## ANTHROPOLOGY

### 20.100 Principles of Social Anthropology

4 Cl.; 4 Q.H.

An introduction to the general fields of anthropological investigations, its scope, and the nature of the integration of the subdisciplines in the concept of culture. Focus on concepts of social structure and organization, function, change, and evolutionary concepts of emerging levels of societal integration.

### 20.103 Elements of Cultural Anthropology

3 Cl.; 3 Q.H.

An introduction to the elements of cultural anthropology; physical anthropology, emphasizing fossil man, human evolution, and problems of race and racial classification. The major part of the course will be the development of the nature of culture and the characteristic features of the life, thought, and culture of primitive peoples.

### 20.110 Human Origins

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

The physical and cultural history of man from an evolutionary point of view, presenting primate background, physical and cultural development of the genus Homo, and raciation. The time span is roughly a million years up to the Neolithic period about 10,000 years ago.

### 20.111 Comparative Civilizations

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

Cultural development from the Neolithic period through the Early Bronze Age. Comparison will be made between the Near East and the distinctive

civilizations of the Far East, India, and Europe, and also with those of the New World. The dynamics of the development as well as substantive culture history will be stressed.

#### **20.120 Primitive Social and Political Organization**

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

The social structure and organization of the simpler band and tribal societies will be presented in a comparative framework; the emphasis is on ecology and functional integration under aboriginal conditions.

#### **20.150 New World Indian Ethnology**

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

The socio-political and ideological aspects of Amerindian societies before major acculturation, emphasizing the functional interrelations of cultural and social institutions.

#### **20.160 Middle Eastern Ethnology**

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

An areal approach considering pastoral, village, town, and city societies and their interrelations; the blending of various historical traditions and the local community as alternative and supplementary approaches.

#### **20.170 Ethnology of Emerging Nations**

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

Aspects of the economic and political forces effective in transforming former colonial areas and traditional cultures into nations in Africa, the Near East, and SE Asia; the effects of this transformation on the social organization of local communities.

#### **20.190 New World Archeology**

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

The archeological evidence of man in the New World from Palaeoindian times through the development of native American civilizations in Mexico and Peru. Cultural evolutionary hypotheses, with comparative data from the Old World, will provide the framework for viewing the New World developments.

#### **20.220 Primitive Religion**

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

The interrelations of religious behavior and belief and other institutions of primitive societies; various sociological and anthropological theories on the origin of religious institutions and the significance of the religious experience in primitive society.

#### **20.240 Introduction to Field Methods** Prereq. 21.240; 3 Cl.; 2 Lab.; 4 Q.H.

Theory and practice of methods of field research, with emphasis upon participant observation techniques, and the analysis of data. Students will take part in a field project.

**20.250 Culture and Personality**

Prereq. 20.100, 20.103, or Ed. 50.103; 4 Cl.; 4 Q.H.

Theories, methods, and the substantive results of anthropological thought and research on the interrelations of human psychology, especially personality, society, and culture is presented with a view toward an integrated approach to the investigation of man.

**20.260 Language and Culture**

Prereq. 20.100, 20.103, or 50.103; 4 Cl.; 4 Q.H.

Communication in non-human societies. The evolution of language. Structural linguistics. Language and thought. Relationships between cultural patterns and language. Recent developments in linguistic theory.

**20.290 Directed Study**

Prereq. 20.120 and dept. approv.; 4 Q.H.

Independent work under the direction of members of the department upon a chosen topic. Limited to qualified seniors preparing in anthropology with approval of department.

**20.291 Directed Study**

Prereq. 20.120 and dept. approv.; 4 Q.H.

**20.295, 20.296, 20.297, 20.298 Honors Program**

Prereq. 20.110 and dept. approv.; (each) 4 Q.H.

See page 101.

## **SOCIOLOGY**

**21.100 Principles of Sociology**

4 Cl.; 4 Q.H.

The basis of human society, the process of individual adjustment to society and the matter of numbers, spatial distribution and organization of people. Social institutions, with emphasis on a structural, functional analysis of institutional life.

**21.102 Principles of Social Relations**

4 Cl.; 4 Q.H.

An introduction to the field of sociology emphasizing the concepts of culture, social organization, social institutions, personality development, and processes of social interaction. This course is offered mainly for Forsyth students.

**21.103 Elements of Sociology**

Prereq. 20.103; 3 Cl.; 3 Q.H.

Modern societies, emphasizing the concepts of social organization, groups, and social stratification, as well as the family and peer group relations and such other institutional areas as religion and education. A continuation of 20.103.

**21.107 Fundamentals of Social Organization**

3 Cl.; 3 Q.H.

The basic concepts of social structure and organization, function, culture, and socialization. The general approach will be cross-cultural. This course is offered mainly for Engineering students.

**21.108 Introductory Sociology**

Prereq. 20.107; 3 Cl.; 3 Q.H.

Basic concepts and theories of sociology, with emphasis on social stratification, social institutions, and processes of social interaction. A continuation of 21.107. This course is offered mainly for Engineering students.

**21.111 American Society**

Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103; 4 Cl.; 4 Q.H.

American society, culture, and major social institutions: economic, religious, governmental, familial, educational, welfare, and recreational; social classes and stratification, mobility, and individualism.

**21.120 Sociology of the Family**

Prereq. 21.100, 21.102, 21.103, 21.108, or Ed. 50.103; 4 Cl.; 4 Q.H.

The family as a social institution in several selected cultures; interrelations of the family and political, economic, and educational institutions; social nature of personality, role-taking, and the effects of individualism, mobility, and industrialism.

**21.130 Criminology**

Prereq. 21.111; 4 Cl.; 4 Q.H.

Patterns and evolution of criminal behavior, the social forces involved, and development of the individual criminal; administration of criminal justice: laws, courts, police, prisons.

**21.135 Juvenile Delinquency**

Prereq. 21.111; 4 Cl.; 4 Q.H.

The sociological and psychological approaches and their implications for a typology of delinquency; problems of prevention, treatment, and rehabilitation.

**2.137 Social Deviance**

Prereq. 21.100; 4 Cl.; 4 Q.H.

Analysis of various social problems, crime, juvenile delinquency, mental disorders, drug addiction, suicide, sexual behavior, poverty, war, and others.

**21.140 Community Analysis**

Prereq. 21.100, 21.108, or Ed. 50.103; 4 Cl.; 4 Q.H.

Relationship of man to his environment; development of the concept of community in relation to physical environment, member population and social institutions; community action programs.

**21.145 Urban Society**

Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103; 4 Cl.; 4 Q.H.

The foundations of city life in historical perspective; relationship of city life to environment, population, social organization, and cultural values; growth trends in American urban life.

**21.150 Race and Cultural Relations**

Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103; 4 Cl.; 4 Q.H.

Racial nationalities and religious groups, particularly with reference to the United States; special emphasis on historical development, specific problems of adjustment and assimilation, and specific present-day problems and trends.

**21.200 Seminar in Group Behavior I**

Prereq. 21.100 or consent of instr.; 4 Cl.; 4 Q.H.

Seminar focuses on: (1) small group theory; (2) the dynamics of group life; (3) individual behavior in the small group setting. Utilizes the seminar experience as a laboratory for learning, planning and experimentation.

**21.201 Seminar in Group Behavior II**

Prereq. 21.200 or consent of instr.; 4 Cl.; 4 Q.H.

Usually continues course 21.200 Places heavier emphasis on providing opportunities for planning and execution of teaching and change projects.

**21.210 Individual and Society**

Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103; 4 Cl.; 4 Q.H.

The problem of adjustment confronting man in complex civilization; the theories of Freud, Sullivan, Horney, Erikson, Cooley, Mead, and Thomas regarding this problem.

**21.220 Introduction to Social Work**

Prereq. 21.111; 4 Cl.; 4 Q.H.

An orientation course planned to acquaint the student with the nature and scope of social work. After a brief survey of the history and early leadership of the movement, the course centers on the modern situation and current trends in the field. The work of both public and private welfare agencies; field trips to various types of social agencies in the metropolitan area.

**21.221 Practicum in Social Welfare**

Prereq. 21.220; 4 Cl.; 4 Q.H.

Discussion of problems in social welfare observed in the term between "Problems" and "Practicum." A research paper, based on directed field work in the intervening term, will be the major course requirement.

**21.239 Introduction to Statistical Analysis**

3 Cl.; 2 Lab.; 4 Q.H.

Application to social data of the principles of measurement, probability, measures of centrality, tests of significance, and techniques of association and correlation.

**21.240 Research Methods I**

Prereq. 21.111; 3 Cl.; 2 Lab.; 4 Q.H.

An introduction to social research including survey techniques, design of research, interviewing, questionnaire construction, use of existing data, and content analysis. Students will take part in a survey.

**21.241 Research Methods II**

Prereq. 21.240; 3 Cl.; 2 Lab.; 4 Q.H.

Analysis of social data by means of coding, tabulating, and statistically interpreting information from surveys and other sources.

**21.250 Political Sociology**

Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103; 4 Cl.; 4 Q.H.

The social functions of politics, studying the extent to which the social structure of society, its classes, occupations, races, levels of opportunity, qualify political activity; the locus of power and its use; the social origins of political leaders; the relation between social and political change.

**21.260 Social Stratification**

Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103; 4 Cl.; 4 Q.H.

Theories of social inequality; concepts of social class; aspects of status and role differences; criteria for social mobility.

**21.270 Social Change**

Prereq. 21.100, 21.102, 21.103, 21.108, or 50.103; 4 Cl.; 4 Q.H.

Social and cultural dynamics with particular reference to the current contact situation occurring between industrialized and non-industrialized societies.

**21.280 Social Theory I**

Prereq. 5 soc. anthro. courses or consent of instr.; 4 Cl.; 4 Q.H.

The development of sociology from the history of social thought. The emergence of several schools, beginning with Positivistic Organicism and Conflict Theory.

**21.281 Social Theory II**

Prereq. 21.280 and consent of instr.; 4 Cl.; 4 Q.H.

A seminar-lecture in which Formalism, Social Behaviorism, Social Action Theory, and Functionalism are studied critically.

**21.290, 21.291 Directed Study**

Prereq. 21.111 and approv. of Dept. Chairman; (each) 4 Q.H.

Independent work under the direction of members of the department upon a chosen topic. Limited to qualified seniors preparing in sociology with approval of Department Chairman.

**21.295, 21.296, 21.297, 21.298 Honors Program**

(each) 4 Q.H.

See page 101.

## Political Science Department

**Professors**

R. Gregg Wilfong, Chairman,  
A.B., M.A., Ph.D.

David W. Barkley, A.B., M.A.,  
Ph.D., M.P.A.

**Associate Professors**

L. Gerald Bursey, B.A., A.M., Ph.D.  
Steve Worth, B.S., Ph.D.

**Assistant Professors**

Robert L. Cord, B.B.A., M.A., Ph.D.  
Minton F. Goldman, B.A., M.A.,

M.A.L.D., Ph.D.

Duane L. Grimes, A.B., M.A.

Edwin D. Palmer, A.B., M.P.A.

**22.101 Introduction to Political Science I**

3 Cl.; 3 Q.H.

The evolution of the modern state: Study of basic political concepts and forms of political organization.

**22.102 Introduction to Political Science II**

Prereq. 22.101; 3 Cl.; 3 Q.H.

Constitutional and totalitarian systems: The development of operative liberty in Western democratic societies with special attention to the content of civil rights in the United States.

**22.103 Introduction to Political Science III** Prereq. 22.102; 3 Cl.; 3 Q.H.  
A comparative analysis of the political process in congressional and parliamentary systems. Survey of international relations through an analysis of American foreign policy since World War II.

**22.105 Principles of Political Science I** 4 Cl.; 4 Q.H.  
Democratic and totalitarian forms of government, the philosophies which underpin them, and the economic and social environment in which they function. Primarily for those students who have not taken the introductory course.

**22.106 Principles of Political Science II** Prereq. 22.105; 4 Cl.; 4 Q.H.  
Current international relations; the foreign policies of the major nation-states in the light of the East-West ideological conflict; the emergence of new nations in Africa and Asia; the necessity of preserving peace in the nuclear age.

**22.114 Political Issues** 5 Cl.; 2½ Q.H.  
Selected political topics based upon major issues, national and international. Primarily for Pharmacy majors.

**22.115 The American Political System and Individual Liberty** 3 Cl.; 3 Q.H.  
An analysis of the Presidency, the Congress, the Supreme Court; and basic liberties essential to a democratic society. Primarily for Engineering majors.

**22.117 World Politics** 3 Cl.; 3 Q.H.  
Recent problems in international affairs as they affect American foreign policy. Special attention is given to the development of the East-West power conflict, the emergence of new states in Africa and Asia, and the problems of maintaining world peace and security in the nuclear age. Primarily for Engineering majors.

**22.131 American National Government** Prereq. 22.103 or 22.106; 4 Cl.; 4 Q.H.  
An analysis of the structure and functions of American Government: The development of legislative policy and the nature of constitutional restraints on public power.

**22.133 Political Parties and Pressure Groups** Prereq. 22.131; 4 Cl.; 4 Q.H.  
Origin, growth, organization, and functions of pressure groups and political parties in the United States.

**22.135 American Constitutional Law** Prereq. 22.131; 4 Cl.; 4 Q.H.  
Analysis of the changing attitudes of the Supreme Court in the areas of federalism, the national economy, foreign affairs, and judicial, congressional, and presidential power.

**22.137 Civil Liberties in the United States** Prereq. 22.131; 4 Cl.; 4 Q.H.  
Utilizing Supreme Court decisions and other reading materials, the constitutional guarantees of speech, press, religion, association, equal protection of laws, and the requirement of procedural due process will be examined.

**22.141 Government and Politics in the States** Prereq. 22.131; 4 Cl.; 4 Q.H.

The structure, functions and politics of the states, analyzing their role in the federal system and their relationships with the national government and their component local governments.

**22.143 Urban and Metropolitan Government** Prereq. 22.141; 4 Cl.; 4 Q.H.

The political, structural and functional problems of an urbanizing United States, including analyses of urban, suburban and metropolitan governmental systems and their roles in the federal system.

**22.151 Comparative Government** Prereq. 22.103 or 22.106; 4 Cl.; 4 Q.H.

European democratic and totalitarian forms of government. The United Kingdom, France, West Germany, and Soviet Russia.

**22.171 Law and Society** 4 Cl.; 4 Q.H.

Introduction to the theory and philosophy of law; the historical foundations of the common law; legal methods. Primarily for Non-Political Science majors.

**22.175 Current Political Issues** 4 Cl.; 4 Q.H.

An analysis of the constitutional and political background of selected contemporary public issues. Primarily for Non-Political Science majors.

**22.221 International Relations** Prereq. 22.103 or 22.106; 4 Cl.; 4 Q.H.

Elements and limitations of national power; contemporary world politics; problem of peace.

**22.223 American Foreign Policy** Prereq. 22.103 or 22.106; 4 Cl.; 4 Q.H.

Formulation and conduct of foreign policy; role of the United States in world politics since 1945.

**22.224 The United States and the Far East**

Prereq. 22.103 or 22.106; 4 Cl.; 4 Q.H.

Relations of the United States with Far Eastern governments with emphasis upon Japan and China since 1945.

**22.225 Soviet Government** 4 Cl.; 4 Q.H.

A study of Soviet political origins and behavior with emphasis on recent changes in the party and state apparatus, the economy, and the administration of justice.

**22.226 Soviet Foreign Policy** Prereq. 22.103 or 22.106; 4 Cl.; 4 Q.H.

The evolution of Soviet foreign policy since 1917 with emphasis on the development of the international Communist movement and the onset of the East-West ideological conflict.

**22.227 Communism in Eastern Europe**

Prereq. 22.103 or 22.106; 4 Cl.; 4 Q.H.

The communist governments of Eastern Europe with emphasis on their growing independence of Soviet Russia. Recent political change, economic liberalization, and new orientations in foreign policy.

**22.228 Government and Politics in Africa**

Prereq. 22.103 or 22.106; 4 Cl.; 4 Q.H.

The governmental systems, political parties, socio-economic problems and foreign policies of selected states north and south of the Sahara. U.S. and Sino-Soviet strategies in Africa.

**22.231 International Organization**

Prereq. 22.221; 4 Cl.; 4 Q.H.

Development of international organization with special emphasis on the United Nations system.

**22.233 International Law**

Prereq. 22.221; 4 Cl.; 4 Q.H.

Territory and jurisdiction of states; treaties; recognition; peaceful settlement of disputes; resort to force.

**22.261 Public Administration**

Prereq. 22.131; 4 Cl.; 4 Q.H.

Introduction to the theory and practice of public administration with special emphasis on the generalities of institutions, processes, and behavior of bureaucratic organizations.

**22.271 Political Theory**

Prereq.: Senior status or consent of instructor; 4 Cl.; 4 Q.H.

Analysis of various approaches to the fundamental problems of government and politics.

**22.272 Selected Issues in Political Theory**

Prereq. 22.271; 4 Cl.; 4 Q.H.

Intensive examination of some dominant issues in modern political theory.

**22.276 American Political Thought**

Prereq. 23.210, 23.211; 4 Cl.; 4 Q.H.

The contributions to political theory of the main social, economic, political, intellectual, and philosophic movements in America from the colonial period to the present.

**22.280 Research Methods in Political Science**

4 Cl.; 4 Q.H.

An analysis of the various approaches to the study of political science. The systems of analysis to be evaluated include: institution, behavioral, legal, and analytical. Primarily for seniors majoring in political science.

**22.285 Senior Seminar in Political Science**

4 Cl.; 4 Q.H.

A study in depth of selected topics in political science. (Prerequisite: Student must be a major in political science and in his senior year.)

**22.290, 22.291 Directed Study**

4 Q.H.

Independent work under the direction of members of the department on a chosen topic. Limited to qualified seniors majoring in political science with approval of department.

**22.295, 22.296, 22.297, 22.298 Honors Program**

(each) 4 Q.H.

See page 101.

# History Department

**Professors**

Raymond H. Robinson, Chairman,  
B.A., M.A., Ph.D.  
Wallace P. Bishop, B.A., M.A., Ph.D.

**Associate Professors (continued)**

Norbert L. Fullington, B.A., M.A.,  
Ph.D.  
Stanley R. Stembridge, A.B., A.M.,  
Ph.D.

**Associate Professors**

Philip N. Backstrom, Jr., B.A.,  
M.A., Ph.D.  
Robert A. Feer, B.A., M.A., Ph.D.  
Martha E. Francois, B.A., M.A., Ph.D.

**Assistant Professors**

David Brudnoy, A.B., M.A.  
Amelia E. Cutts, B.A., M.A.

**Instructors**

Suzanne Hamner, B.A., M.A.  
Gerald H. Herman, B.A., M.A.

**23.101 Western Civilization**

3 Cl.; 3 Q.H.

The beginnings of Western Civilization with emphasis on the political, economic, and social history of the ancient and medieval world.

**23.102 Western Civilization**

3 Cl.; 3 Q.H.

Modern Europe to 1850 with an examination of the two major intellectual movements—the Renaissance and the Enlightenment—and their impact upon religious movements, economic developments, and the rise of national states.

**23.103 Western Civilization**

3 Cl.; 3 Q.H.

Western Civilization since 1850, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace.

**23.111 Ancient Greece**

4 Cl.; 4 Q.H.

The origins and development of Greek civilization; political evolution of Hellenistic society from tribal to city-state organization; growth and application of Greek religious, political, and ethical ideas.

**23.112 Ancient Rome**

4 Cl.; 4 Q.H.

Roman civilization in two sequences: the rise of Roman power under the Republic, and the decline of Roman power under the Empire.

**23.115 Medieval Europe**

4 Cl.; 4 Q.H.

Europe from the decline of the Roman Empire to 1215; the development of Christianity and the expansion of the Church to Innocent III; the conflict between Pope and Holy Roman Emperor; manorialism and feudalism; the Christian philosophers and theologians; the growth of trade and towns.

**23.117 The Rise of Nation States**

4 Cl.; 4 Q.H.

The political and economic life of Europe from the thirteenth to the end of the seventeenth century; monarchy and constitutional government; the growing conflict between church and state; the growth of capitalism and international trade.

**23.118 The Renaissance and Reformation** 4 Cl.; 4 Q.H.  
European culture from the thirteenth to the seventeenth century; humanism; the rebirth of classicism in literature and the arts; the decline of the Church and the rise of Protestant sects; the social and cultural consequences of the religious wars.

**23.120 Eighteenth Century Europe** 4 Cl.; 4 Q.H.  
Europe in the Age of Enlightenment, when concepts were advanced which produced sweeping changes in government and society.

**23.121 Nineteenth Century Europe** 4 Cl.; 4 Q.H.  
Europe during a century of dramatic transformation: the Industrial Revolution, the post-Napoleonic reaction, liberalism, socialism, nationalism, imperialism, and the coming of World War I.

**23.125 Modern Europe** 4 Cl.; 4 Q.H.  
Europe since 1914, with an examination of World War I, the rise of Communism and Fascism, the struggle for stability and social justice in the western democracies, World War II, and the Cold War.

**23.126 European Intellectual History Since 1815** 4 Cl.; 4 Q.H.  
The main currents of European thought since Waterloo, considered in their social and political context.

**23.130 England to 1688** 4 Cl.; 4 Q.H.  
Prehistoric Britain, the Anglo-Saxons, the Normans, the Plantagenets, the Tudors, and the Stuarts, with emphasis on the development of parliamentary institutions until the Glorious Revolution.

**23.131 England since 1688** 4 Cl.; 4 Q.H.  
England from the Glorious Revolution to the present, with emphasis on the development of Parliament, the Industrial Revolution, nineteenth century reaction and reform, the world wars, and the rise of socialism.

**23.133 Stuart England** 4 Cl.; 4 Q.H.  
England from 1603 to 1688, with emphasis on social and economic change and the origins of modern liberalism.

**23.135 Victorian England** 4 Cl.; 4 Q.H.  
The economic, social, and political life of the English people during Victoria's reign.

**23.137 England since 1900** 4 Cl.; 4 Q.H.  
The economic, social, and political life of the English people in the twentieth century.

**23.138 Ireland, 1801-1922** 4 Cl.; 4 Q.H.  
A study of the Irish Question in British politics from the Act of Union to the establishment of the Free State, with special emphasis on Ireland as an underdeveloped country.

**23.140 Imperial Russia** 4 Cl.; 4 Q.H.  
The emergence of Russia as a recognized European power; westernization and expansion in the eighteenth century; the impact of Napoleon; reform and revolution.

**23.141 Soviet Russia** 4 Cl.; 4 Q.H.  
Forces molding the history of Russia since 1917; internal developments; foreign relations.

**23.144 The Middle East to 1900** 4 Cl.; 4 Q.H.  
The Middle East from earliest times to the twentieth century, with emphasis on the flowering of Islam and the beginning of European colonialism.

**23.145 Modern Middle East** 4 Cl.; 4 Q.H.  
The Middle East from 1900 to the present, emphasizing the rise of nationalism, Zionism, Pan Arabism, the effects of two world wars and the postwar settlements; the impact of oil; and the changing culture of the Middle East.

**23.150 The Commonwealth Countries** 4 Cl.; 4 Q.H.  
The evolution of the British Empire into the Commonwealth of Nations and the development of the principal Commonwealth countries (excluding Africa). Special emphasis on the history of Canada, Australia, New Zealand, and India.

**23.151 Modern Africa** 4 Cl.; 4 Q.H.  
The European impact on Africa; the rise of African nationalism; the emergence of independent African states and the background of their present problems.

**23.169 Far Eastern Civilization to 1850** 4 Cl.; 4 Q.H.  
Premodern histories and cultures of China, Japan, and Korea from antiquity to 1850.

**23.170 Modern Far East** 4 Cl.; 4 Q.H.  
The Far East since 1850, with emphasis on China and Japan and their relations with other nations.

**23.190 Europe and America, 1900-1933** 3 Cl.; 3 Q.H.  
The impact of World War I and the Great Depression on the stable and peaceful society of the early twentieth century.

**23.191 Europe and America since 1933** 3 Cl.; 3 Q.H.  
The search for a new social order and for international peace after 1933.

**23.199 The Historian's Craft** 4 Cl.; 4 Q.H.  
The ways in which the historian studies the past and the nature of historical statements. Problems considered include research techniques, changing conceptions of historical knowledge, and the relationship between the historian and the society in which he works.

**23.201 Colonial America** 4 Cl.; 4 Q.H.  
The discovery and exploration of the New World; the settlement of the

English colonies on the North American mainland; their development to 1763; and the origins of their clash with England.

**23.210 The United States to 1865** 4 Cl.; 4 Q.H.

The history of the American people from 1763 to 1865, with an analysis of the American Revolution and of the major political, constitutional, diplomatic, economic, and social problems of the new nation.

**23.211 The United States since 1865** 4 Cl.; 4 Q.H.

A continuation of the survey of American history with discussion of the emergence of an industrial economy, an urban society, world responsibility, and expanded federal government.

**23.213 American Urban History** 4 Cl.; 4 Q.H.

The development of urban society in the United States in the nineteenth and twentieth centuries, with emphasis on the effects of immigration and industrialization upon the politics, thought, and society of American cities.

**23.215 The United States, 1781-1825** 4 Cl.; 4 Q.H.

The political, economic, and psychological problems of adjustment to peace at the conclusion of the American Revolution; the development of an independent nation to 1825.

**23.217 Topics in American History, 1825-1900** 4 Cl.; 4 Q.H.

An intensive analysis of selected topics in nineteenth century American history.

**23.220 The United States, 1900-1933** 4 Cl.; 4 Q.H.

Progressivism, World War I, and the reaction of the 1920's, concluding with the panic of 1929 and the onset of depression.

**23.221 The United States since 1933** 4 Cl.; 4 Q.H.

The New Deal, World War II, and mid-century, emphasizing the clash between liberalism and conservatism, the movement from isolationism to interventionism, and the postwar struggle against communism.

**23.222 The United States since 1945** 4 Cl.; 4 Q.H.

America's diverse responses to the postwar challenges of urbanization, economic change, civil rights, and communism.

**23.223 Twentieth Century United States** 4 Cl.; 4 Q.H.

The United States in the twentieth century, with an examination of the political, social, and economic characteristics of the major chronological periods: Progressivism, World War I, the 1920's, the New Deal, World War II, and mid-century. (Not open to students who intend to receive credit for 23.211, 23.220, 23.221).

**23.230 The Westward Movement** 4 Cl.; 4 Q.H.

America's westward movement in the nineteenth century, and its impact on the political, social, and economic life of the nation.

<b>23.235 American Diplomatic History</b>	4 Cl.; 4 Q.H.
The formation and administration of American foreign policy from the Revolution to the present.	
<b>23.250 American Historians</b>	4 Cl.; 4 Q.H.
The literature of American history; major American writers of American history from the colonial period to the present, with emphasis on changing form and substance.	
<b>23.276 Latin America to 1850</b>	4 Cl.; 4 Q.H.
The fusing of the cultures of the Indian, the Iberian, and Negro; the European and American forces which gave rise to the Latin American wars for independence; the early development of the new nations.	
<b>23.277 Modern Latin America</b>	4 Cl.; 4 Q.H.
Latin America from the mid-nineteenth century to the present; dictatorial republics and the continuation of poverty and injustice; the struggles toward democracy, the rise of nationalism, and the threat of communism; the relations between the United States and Latin America.	
<b>23.288 Seminar in Medieval History</b>	4 Cl.; 4 Q.H.
<b>23.290 Seminar in Modern European History</b>	4 Cl.; 4 Q.H.
<b>23.291 Seminar in American History</b>	4 Cl.; 4 Q.H.
<b>23.295, 23.296, 23.297 Honors Program</b>	(each) 4 Q.H.
See page 101.	

## Philosophy and Religion Department

### **Professor**

Charles W. Havice, A.B.,  
M.A., S.T.B., Ph.D., D.D.

### **Assistant Professors**

Sally J. Michael, A.B., M.A.  
Joseph H. Wellbank, A.B., A.M., Ph.D.

### **Associate Professors**

Walter L. Fogg, Chairman, B.A.,  
M.A., Ph.D.  
Edward A. Hacker, B.A., M.A., Ph.D.

### **Instructor**

Ellen Gordon, B.A., M.A.

<b>26.101 Introduction to Philosophy I</b>	4 Cl.; 4 Q.H.
What philosophy is, its methods, functions, and relations to other subjects; the nature of philosophical analysis, especially in regard to man's basic beliefs about knowledge and value; stress upon the justification of such basic beliefs and the clarification of the language and concepts in terms of which such beliefs are expressed.	

**26.102 Introduction to Philosophy II**

Prereq. 26.101 or consent of instr.; 4 Cl.; 4 Q.H.

A comparative analysis of some of the major types of philosophical systems in light of their differing views as to the nature of man, value, causality, purpose, and God; the important issues which have come out of the lasting dialogue among Naturalists, Materialists, Idealists, and Theists.

**26.110 History of Ancient Philosophy**

4 Cl.; 4 Q.H.

The beginnings of Greek philosophy before the time of Socrates; emphasis upon the thought and influence of Socrates, Plato, and Aristotle; secondary attention given to the Epicureans, the Stoics, and the Neo-Platonists.

**26.111 History of Modern Philosophy**

Prereq. 26.110 or 26.101; 4 Cl.; 4 Q.H.

European philosophy from the Renaissance to the nineteenth century; emphasis upon Francis Bacon, Descartes, Spinoza, Locke, Berkeley, Hume, and Kant.

**26.117 Nineteenth Century Philosophy**

Prereq. four quarter hours of Phil.; 4 Cl.; 4 Q.H.

Selected trends in this century, such as the development of German Idealism, Romanticism, Evolutionism, Materialism, and Positivism. Hegel, Schopenhauer, Nietzsche, Marx, and Comte are representative.

**26.118 Twentieth Century Philosophy**

Prereq. four quarter hours of Phil.; 4 Cl.; 4 Q.H.

Contemporary philosophic movements such as realism, logical empiricism, linguistic analysis, pragmatism, and existentialism.

**26.119 American Philosophy**

4 Cl.; 4 Q.H.

A critical survey and analysis of the development of American philosophy from Puritanism to Pragmatism; emphasis upon Royce, Peirce, W. James, Dewey, and Whitehead.

**26.120 Existentialism**

Prereq. 4 Q.H. of Philosophy; 4 Cl.; 4 Q.H.

The influence of Kierkegaard and Nietzsche upon twentieth century existentialism; its critique of scientific and traditional philosophy; the influence of existentialism upon literature and theology; emphasis upon Jaspers, Heidegger, Marcel, and Sartre.

**26.121 Analytic Philosophy**

Prereq. 26.150; 4 Cl.; 4 Q.H.

The development of logical empiricism; its conception of philosophy; its theories of meaning, knowledge, value, and its rejection of metaphysics; special emphasis given to the principles of verifiability.

**26.130 Aesthetics**

4 Cl.; 4 Q.H.

A descriptive and critical investigation into the nature and meaning of aesthetic experience, art, and the principles of criticism; consideration of the possibility of standards in art and the relations of art to ethics, society, and religion.

**26.131 Social Philosophy**

4 Cl.; 4 Q.H.

Critical examination of the leading socio-political ideologies in regard to their conceptions as to the character, structure, and function of society;

emphasis upon a normative approach to the principles, means, and goals which underlie these major conceptions.

**26.133 Philosophy of Science** 4 Cl.; 4 Q.H.

An introduction to some of the crucial methodological problems in modern science; some of the topics are metaphysical presuppositions in science, concepts of causality, theory construction and theory reduction techniques, teleological and deterministic models, and the special methodological problems of the individual sciences.

**26.134 Philosophy of Religion** 4 Cl.; 4 Q.H.

What is religion? What are the basic conceptions of God? What are the arguments for and against belief in deity? The problem of natural and moral evil, the various beliefs in immortality, the cognitive status of theological statements.

**26.135 Philosophy of History** Prereq. 4 Q.H. of Philosophy; 4 Cl.; 4 Q.H.

The nature and problems of historical explanation; the function of value judgments and myth in such explanations; discussion of the Christian, Marxist, and Idealistic interpretations of history.

**26.136 Philosophy of Education** 4 Cl.; 4 Q.H.

A critical analysis of the assumptions, functions, and procedures of educational policies and practices; theories about the nature, aims, and values of education within the wider context of a philosophy of man and society.

**26.140 Elements of Philosophy** 3 Cl.; 3 Q.H.

Nature and spirit of philosophy; its relation to science, literature, and religion; main systems and the great ideas among philosophers; how philosophy applies to daily experience and its suggested answers to the perennial questions encountered by the thinking person.

**26.141 Problems of Philosophy** Prereq. 26.140; 3 Cl.; 3 Q.H.

Continues the principal questions raised in 24.140. Attention to problems in the philosophy of religion and the relationships between the great religions of the world.

**26.142 Foundations in Ethics** 5 Cl.; 2.5 Q.H.

Right and wrong, good and evil, obligation and mature moral responsibility; nature of value judgments; chief schools of ethical thought; questions of freedom of choice, basic values, and recent trends.

**26.150 Introduction to Logic** 4 Cl.; 4 Q.H.

Formal principles of correct and incorrect reasoning, meaning, and significance of language; practical exercises in effective argument; and recognition of common fallacies.

**26.151 Symbolic Logic** Prereq. 26.150 or consent of instr.; 4 Cl.; 4 Q.H.

An extensive analysis of class calculus and propositional logic; the techniques of matrix analysis; the axiomatic method; and natural deduction.

**26.155 Ethics** 4 Cl.; 4 Q.H.

Nature and importance of ethics; its relation to philosophy, psychology, sociology, and religion; views of human nature; standards for morality; authori-

tarianism, naturalism, intuitionism, formalism, hedonism, relativism, and emotivism.

**26.156 Modern Ethical Theories** Prereq. 26.155; 4 Cl.; 4 Q.H.

Selected themes in ethics such as detailed analyses of ethical theories, modern theories of value, and the relations of ethical theory to epistemology and metaphysics; issues in meta-ethics.

**26.170 Western Religions** 4 Cl.; 4 Q.H.

Teachings of contemporary Judaism, Roman Catholicism, Protestantism, and Islam. Their interpretation of modern man's life and culture.

**26.171 Oriental Religions** 4 Cl.; 4 Q.H.

Comparative study of beliefs and contributions of the oriental religions of our modern world. Emphasis upon Hinduism, Buddhism, Confucianism, and Taoism.

**26.173 Modern Religious Thinkers** Prereq. 26.134; 4 Cl.; 4 Q.H.

A consideration of such problems as the nature of religious language and symbols, psychology and religion, existentialism and theology, modern trends in theology; reading in the works of contemporary theologians and philosophers whose writings deal with these topics.

**26.180, 26.181 Seminars**

Prereq. 8 cr. hours of phil. or consent of instr.; 4 Cl.; 4 Q.H.

Special topics chosen for reading, writing and discussion. During Spring Quarter, 1968, seminar in Plato. Plato's systematic treatment of philosophical problems in epistemology, ontology, and social philosophy. Intensive reading and discussion in the major Platonic dialogues.

**26.185, 26.186 Directed Studies**

Prereq. lim. to qualified seniors; 4 Cl.; 4 Q.H.

With the consent of the department, majors may pursue a course of directed study and conferences under the supervision of a member of the staff.

**26.190, 26.191, 26.192 Honors Program**

(each) 4 Q.H.

## Art Department

**Professor**

George H. Meserve, Jr., B.S., Ed.M.

**Assistant Professor**

Leonard M. Havens, B.S., M.Ed.

**Associate Professors**

Robert L. Wells, Chairman, B.S., M.A.

**Instructors**

Ronald C. Davis, A.B., M.Ed.

Samuel S. Bishop, B.A., M.A., M.F.A.

Wheaton A. Holden, A.B., M.A.

Michael S. Dvorchak, A.B., M.A.

**27.101 Foundations of Western Culture**

3 Cl.; 3 Q.H.

The early world and ancient man; the ancient cultures of Mesopotamia, Egypt, Crete, Greece, and Rome.

**27.102 Foundations of Western Culture** Prereq. 27.101; 3 Cl.; 3 Q.H.  
The Early Christian and Byzantine periods; the Moslem World; European invasions and the Feudal Age.

**27.103 Foundations of Western Culture** Prereq. 27.102; 3 Cl.; 3 Q.H.  
The Gothic Age; the Renaissance; the Age of Exploration and Discovery, and European influences on American culture.

**27.104 Foundations of American Culture** 3 Cl.; 3 Q.H.  
Our European heritage and the development of American culture from colonial times to the 19th century.

**27.111 Elementary Drawing and Lettering** 2 Cl.; 4 Lab.; 4 Q.H.  
Elementary mechanical drawing problems; Gothic, Roman, and Script lettering, and tracings in ink.

**27.112 Pictorial Drawing** Prereq. 27.111; 2 Cl.; 4 Lab.; 4 Q.H.  
Isometric, oblique, and cabinet drawings; linear perspective; and industrial production illustration.

**27.113 Creative Drawing** 4 Cl.; 4 Q.H.  
Creative drawing problems in pen and ink, and pencil, with emphasis on form and texture; problems in illustration.

**27.114 Theory of Color and Design I** 4 Cl.; 4 Q.H.  
Techniques and theories of design and color in painting. Students execute compositions in water color.

**27.115 Theory of Color and Design II** 6 Lab.; 4 Q.H.  
Problems in landscape and still life painting, costume figure composition and illustration.

**27.131 Ancient Art** 4 Cl.; 4 Q.H.  
Materials and techniques employed by ancient artisans in architecture, sculpture and painting; prehistoric art and the arts of ancient Egypt, Mesopotamia, Crete, Greece, and Rome.

**27.132 Medieval Art** 4 Cl.; 4 Q.H.  
Early Christian, Byzantine, Romanesque, and Gothic art.

**27.133 Italian Renaissance Art** 4 Cl.; 4 Q.H.  
Italian Renaissance architecture, sculpture, and painting.

**27.134 Byzantine Art** 4 Cl.; 4 Q.H.  
Architecture, sculpture, painting and the minor arts of the Byzantine Empire from the fourth to the fifteenth centuries.

**27.141 European Art** 4 Cl.; 4 Q.H.  
The Baroque period of art and the European Renaissance period. Architecture, sculpture, painting, and the graphic arts up to the end of the nineteenth century.

**27.142 Spanish Art** 4 Cl.; 4 Q.H.  
A study of Spanish architecture, sculpture and painting from the Gothic period to the twentieth century.

**27.151 Modern Painting** 4 Cl.; 4 Q.H.  
The stylistic and historical development of painting from the late nineteenth century to the present.

**27.152 Introduction to the Arts** 4 Cl.; 4 Q.H.  
This course is designed to provide a wide range of possible experiences in the visual arts by various technical and creative processes.

**27.161 American Art I** 4 Cl.; 4 Q.H.  
Development of American architecture, sculpture, and painting, from colonial times to about 1860.

**27.162 American Art II** 4 Cl.; 4 Q.H.  
American architecture, sculpture, and painting from 1860 to the present.

**27.171 Ancient Architecture** 3 Cl.; 3 Q.H.  
Prehistoric art and the art and architecture of Egypt, Mesopotamia, Crete, Greece, and Rome.

**27.172 Medieval and Renaissance Architecture** Prereq. 27.171; 3 Cl.; 3 Q.H.  
Early Christian, Byzantine, Romanesque, Gothic, and Italian Renaissance architecture.

**27.173 Renaissance and Modern Architecture** Prereq. 27.172; 3 Cl.; 3 Q.H.  
Architectural and modern developments in Europe and America from the Baroque period to contemporary times.

**27.181 Oriental Art I** 4 Cl.; 4 Q.H.  
The prehistoric arts of India, China, and Japan; the rise and spread of international Buddhist art; the national Indian styles of sculpture, architecture, and painting.

**27.182 Oriental Art II** 4 Cl.; 4 Q.H.  
National styles of painting, sculpture, architecture, ceramics, and print-making in China, Korea, and Japan.

## Music Department

### Associate Professors

Roland L. Nadeau, Chairman,  
B.M., M.M.  
Leo Snyder, B.M., M.M.

### Assistant Professors

Joan C. Bicknell, B.S., M.A., Ph.D.  
William A. Tesson, B.M., M.M.

### 28.100 Music Appreciation

4 Cl.; 4 Q.H.

Designed for those who may take only one music course. Main emphasis is on the listening experience itself and how it relates to the lives of the composers and their social background. Relationships with other arts. Musical forms.

**28.101 Music Fundamentals — Theory** 4 Cl.; 4 Q.H.  
 Music notation; intervals; major and minor scales; modes; elementary chord structures and relationships; tonality; music reading skills.

**28.102 Music Fundamentals — Applied** 4 Cl.; 4 Q.H.  
 Sight singing and ear training; intervals, scales, melodies; rhythmic exercises to develop coordination; elementary harmonization of melodies; special emphasis on part singing.

**28.103 Musical Forms** 4 Cl.; 4 Q.H.  
 The fugue; the sonata; theme and variations; the lied; analysis of the symphony, the string quartet, the opera, and the tone poem.

**28.104 Foundations of Music** 4 Cl.; 4 Q.H.  
 Designed as a basic course for those interested in taking further music courses. How to listen creatively. Basic vocabulary. Instruments of the orchestra. How to follow score profiles. Music history survey. Musical forms.

**28.110 Introduction to Music** 3 Cl.; 3 Q.H.  
 The ear and the eye: how to follow a score; the basic ingredients in music: rhythm, chords, scales, notation, extra-notational symbols; architecture in music: its shape, structure, and function.

**28.111 From Bach to Stravinsky** Prereq. 28.110; 3 Cl.; 3 Q.H.  
 A survey of musical style from the Baroque to the Contemporary. The analytical techniques acquired by the student in the previous course, 28.110, applied to the music of the major masters of the past 200 years. Particular emphasis placed on contemporary music, including jazz.

**28.120 Musical History I** 4 Cl.; 4 Q.H.  
 Its broad aspects, with emphasis on Classical and Romantic periods; the evolution of musical styles; the development of instruments and the expanding orchestra; social background as it affects musical style; Bach-Handel; Mozart-Haydn; Brahms-Wagner; Debussy-Ravel; comparative studies; emerging importance of the composer as an individual in society.

**28.121 Musical History II** Prereq. 28.120; 4 Cl.; 4 Q.H.  
 Detailed study of the evolution of musical styles with emphasis on the periods preceding and following the Classic-Romantic Era; ancient instruments and the music written for them; the beginnings of counterpoint and harmony; polyphony: madrigal and motet; Impressionism and post-Romanticism.

**28.122 Music Masterpieces before 1750** 4 Cl.; 4 Q.H.  
 Important musical developments from the plain chant era through the Baroque; recordings of various works from individual scores.

**28.123 Music in the Romantic Era** 4 Cl.; 4 Q.H.  
 Representative score by such composers as Schubert, Schumann, Berlioz, Chopin, and Wagner are analyzed to follow the development of the Romantic Movement in music.

**28.130 Contemporary Music**

Prereq. 28.100, 28.101, 28.102, 28.104, 28.120; 4 Cl.; 4 Q.H.

The impact of Debussy and Impressionism on the music of the twentieth century; new emphasis on rhythm; Stravinsky; new methods of tonal organization: Schoenberg, Hindemith, Bartok; the American school; the European influence; MacDowell and Indian themes; the second generation: Copland, Piston, Carter; rediscovering Ives; the place of jazz; current trends and experiments; electronic music.

**28.135 Music in North America**

4 Cl.; 4 Q.H.

Indian music, Mexican music; American music from colonial times to the present; effect of Stravinsky and Schoenberg on American composers; music for the theatre; jazz, electronic music, contemporary trends.

**28.138 Nationalism in Music**

4 Cl.; 4 Q.H.

The relationship of folk song, dance, and art to symphonic literature; nationalistic elements in the music of Dvorak, Tchaikovsky, Grieg, Copland, Shostakovich, Sibelius; the effect of political ideology on composers: the Soviet composers.

**28.140 Mozart—The Man and His Music**

4 Cl.; 4 Q.H.

The major compositions of Mozart in the following forms: symphony, sonata, concerto, opera, sacred music, chamber music. The essence of his genius is facility in all forms of composition. "Compared" to Shakespeare, Mozart, the child prodigy; the mature artist; the Mozart correspondence.

**28.145 The Life and Works of Beethoven**

4 Cl.; 4 Q.H.

Major compositions by Beethoven in the following forms: sonata, concerto, symphony, string quartet, opera, sacred music, variation form; three great periods of his life; the man, Beethoven, and society; revolutionary tendencies in his music; the expression of the individual as the essence of his art.

**28.160 The Symphony**

4 Cl.; 4 Q.H.

Structural development of the symphonic form. Significant symphonies of Haydn, Mozart, and Beethoven, Brahms, Tchaikovsky, and others.

**28.170 Chamber Music**

4 Cl.; 4 Q.H.

From duets to octets, from Mozart to Milhaud, this survey will cover scores of some of the most intensive and serious creations in the mainstream of Western music.

**28.180 Introduction to Opera (Opera I)**

4 Cl.; 4 Q.H.

Important opera scores from Don Giovanni to the present.

**28.181 Opera II**

Prereq. 28.180; 4 Cl.; 4 Q.H.

Exploration-in-depth of opera as theatre, as musical drama, as pure music; the problem of the libretto; composer-librettists: Wagner, Menotti, Boito; opera text as literature and libretto; literary masterpieces transformed into opera: *Romeo and Juliet*, *Turn of the Screw*, *Faust*.

**28.190 Concerto** 4 Cl.; 4 Q.H.  
 Origins in the Baroque Period; concerto grosso style; solo concerto; concerto and the development of virtuosity; concerto for orchestra; concertos for various instruments: piano, violin, clarinet, bassoon, French horn, cello viola, flute; the romantic concerto and the great performer-composer: Chopin, Liszt, Paganini, others.

**28.200 Jazz — Development and Essence** 4 Cl.; 4 Q.H.  
 Background in rhythms, worksongs, European harmony, African rhythms; beginnings in New Orleans: later influences; ragtime, blues, swing, and later styles; rhythmic basis: syncopation, combined rhythms, elemental drives; improvisation; influence on serious contemporary composers in the classical tradition.

**28.201 Folk Music — Origin and Meaning** 4 Cl.; 4 Q.H.  
 Primitive beginnings; similarities and differences in various cultures; the scalar basis for folk melody; asymmetrical rhythm; folk music as used by the masters; later developments; its existence in today's culture.

**28.210 Musical Theatre** 4 Cl.; 4 Q.H.  
 An historical survey and analytic study of musical theatre from *The Black Crook* (1866) to *My Fair Lady* and *West Side Story*; major works by Romberg-Kern, Rogers and Hammerstein, Lerner and Lowe, Bernstein, and others. The course is intended to show the gradual change from melodrama and review to the sophisticated comedies and quasi-tragedies of the present day musical theater.

**28.220 The Aesthetics of Music** 4 Cl.; 4 Q.H.  
 Views of the relationship of art and society from Plato to Langer; form and content; dynamic continuity; the meaning of music; the music critic; detailed analysis of several works.

## Drama and Speech Department

### Professor

Eugene J. Blackman, Chairman,  
 B.S., M.A.

### Instructors

John P. Bertsch, B.S., M.S.  
 Bernice L. Bronson, B.A., M.F.A.  
 Carl W. Eastman, B.A., M.A.

### Assistant Professors

Lawrence J. Blumsack, B.S., M.S.  
 Mort S. Kaplan, B.A., M.A.  
 Michael L. Woodnick, B.S., M.S.

**29.100 Public Speaking** 3 Cl.; 3 Q.H.  
 Basic principles and techniques of effective modern speaking; emphasis on conversational delivery and clear, concise composition through group procedures, impromptu speaking, and the handling of short expository forms.

<b>29.101 Public Speaking</b>	Prereq. 29.100; 3 Cl.; 3 Q.H.
Speech patterns which involve effective discussion; analysis, evidence, and reasoning as factors in convincing and persuading people.	
<b>29.102 Effective Speaking</b>	3 Cl.; 3 Q.H.
Fundamentals of speaking, conferring, and reporting. The class is organized as a functional group with officers and agenda.	
<b>29.103 Effective Speaking</b>	2 Cl.; 2 Q.H.
Fundamentals of speaking, conferring, and reporting. The class is organized as a functional group with officers and agenda.	
<b>29.104 Effective Speaking</b>	Prereq. 29.103; 2 Cl.; 2 Q.H.
Continuation of 29.103.	
<b>29.105 Argumentation and Debate</b>	4 Cl.; 4 Q.H.
Argumentation and debate presented as techniques of a free society, bringing reasoned discourse to bear on personal and social problems for purposes of decision and action, with attention being given to the various forms of debating techniques.	
<b>29.106 Speech Fundamentals</b>	3 Cl.; 3 Q.H.
Basic principles and techniques of effective modern speaking. Examining individual voice and articulation problems. Studying and applying basic techniques of oral interpretation.	
<b>29.107 Public Relations and Communications</b>	4 Cl.; 4 Q.H.
A practical course aimed at giving insight into the understanding of the problems and procedures, and use of the mass media as means of communication.	
<b>29.110 Voice and Articulation</b>	4 Cl.; 4 Q.H.
Anatomy and physiology of the vocal mechanism; properly controlled breathing for phonation; resonance and articulation; correction of individual voice and articulation problems.	
<b>29.111 Oral Interpretation</b>	Prereq. 29.110 or permission; 4 Cl.; 4 Q.H.
Application of basic vocal techniques to the dramatic interpretation of various forms of literature, including the study of dialects and accents. Prerequisites 29—Voice and diction on permission of the instructor.	
<b>29.120 Introduction to Theatre Arts</b>	4 Cl.; 4 Q.H.
A brief view of the historical development of acting, directing, and production design; emphasis on appreciation of contemporary theatrical forms.	
<b>29.125 Introduction to the Theatre</b>	3 Cl.; 3 Q.H.
Theatre history and tradition; samplings of dramatic literature from the great ages of theatre; theatre as a mirror of society; the rise of theatre as a profession and as an art form; the role of the playwright, director, and actor; the audience as critic.	

**29.126 Play Production** Prereq. 29.125; 3 Cl.; 3 Q.H.  
Solving the problems posed by the script: interpretation, style, design, lighting and construction; the technical man as an artist who gains an appreciation of theatre through solving the artistic and technical problems of production: theatre architecture; stage mechanics; principles of lighting, construction, and design.

**29.130 Makeup** 4 Cl.; 4 Q.H.  
Examining the principles of, the reasons for, and the materials used in makeup for the theatre, television, and films. The practical application of types and styles of makeup.

**29.150 Acting** 4 Cl.; 4 Q.H.  
Fundamental techniques of acting: use of body and voice in dramatic interpretation; training in strengthening imagination and increasing freedom; analysis of script; improvisation in preparation for work on the script.

**29.151 Acting** Prereq. 29.150; 4 Cl.; 4 Q.H.  
Intermediate techniques of the actor's work; detailed analysis of the script including action and vocal score; character interpretation; scenes and one-act plays.

**29.152 Theories and Styles of Performance** Prereq. 29.151; 4 Cl.; 4 Q.H.  
Advanced acting techniques; study of acting styles in major theatrical periods and participation in classroom exercises; scenes and one-act plays.

**29.160 Concepts of Direction** 4 Cl.; 4 Q.H.  
For drama majors only or by permission of instructor. The theories of dramatic presentation through analysis of selected historical directorial developments; purposes and techniques of theatrical direction as they relate to script analysis, production style, pictorial composition, rhythmic evolution, emphatic responses.

**29.161 Problems in Direction** Prereq. 29.160; 4 Cl.; 4 Q.H.  
Experimentation of theory related to the staging of classical and modern drama; analysis of plays for actual production; casting; rehearsals; character interpretations. Each student is responsible for the production of a one-act play.

**29.162 Elements of Play Production** 4 Cl.; 4 Q.H.  
Coordinating the work of the production and business staffs; the functions of the stage manager, business manager, and subordinate departmental heads; their relationship with associates; the conduct of production preparations, rehearsals and performance.

**29.163 Workshop in Play Production** 4 Cl.; 4 Q.H.  
A course for the recreation teacher and leader in school, camp, settlement house, playground to train him in the selection, planning, and organization of both informal and formal dramatics activities.

**29.166 Shakespearean Production** Prereq. a course in Shakespeare and 29.161; 4 Cl.; 4 Q.H.  
A detailed analysis of three types of Shakespearean plays — the tragedy

(the tragedy of blood), the comedy, the history — with the aims of discovering the production values and of determining the production methods to mount the types successfully in the modern theatre.

**29.170 Scenic Production** 4 Cl.; 4 Q.H.

Principles which underlie scenic coordination and development; basic propositions governing techniques of dramatic architecture; production materials; color and light.

**29.171 Design and Lighting** Prereq. 29.170; 4 Cl.; 4 Q.H.

The basic principles of design and lighting for the stage; historical analysis of composition and design from classical to modern periods; execution of designs for productions.

**29.175 Costuming** 4 Cl.; 4 Q.H.

Investigation of the historical development of dramatic costuming as it relates to the unified dramatic concept; execution of theories associated with visual projection, line, color, dark and light.

**29.180 Playwriting** 4 Cl.; 4 Q.H.

The principles and practices of modern dramatic composition: characterization, plot, plot structure, dialogue, and other dramaturgical elements as seen in the one-act play; the writing of brief scenes; the dramatic, and the one-act play.

**29.181 Playwriting** Prereq. 29.180 or permission; 4 Cl.; 4 Q.H.

A continuation of 29.180. The writing of the longer plays. Each student will be required to submit the equivalent of a full-length play.

**29.185 Children's Theatre** 4 Cl.; 4 Q.H.

Theories and methods of relating creative techniques to work with children's programs in schools, churches, and recreational facilities; analysis of literature in preparation for production of plays for children.

**29.189 Socio-Drama** 4 Cl.; 4 Q.H.

The creative dramatic process in the exploration and solution of social problems.

**29.200 History of the Theatre** 4 Cl.; 4 Q.H.

Development of the theatre and the drama of Greece and Rome, medieval Europe, Elizabethan and Restoration England, and 17th century France; an examination of playwriting, acting styles, scene design, theatre architecture, and the relationship among these elements.

**29.201 History of the Theatre** 4 Cl.; 4 Q.H.

Development of the European theatre of the 18th, 19th, and early 20th centuries; growth and development of the proscenium theatre; the emphasis upon naturalistic and realistic presentation; the theatre innovations.

**29.202 The Classic Theatre of Greece and Rome** 4 Cl.; 4 Q.H.

The beginnings of theatre and its growth as a potent institution and as an art form. A detailed study of the interrelation of the dramatic form and the theatre structure and the works of the major playwrights.

<b>29.205 The Restoration Theatre</b>	4 Cl.; 4 Q.H.
The philosophical, social, historical, critical influences upon the Restoration Theatre and its dramatists.	
<b>29.210 The American Theatre</b>	4 Cl.; 4 Q.H.
The American Theatre from the Revolutionary War to the present.	
<b>29.211 The Theatre of Williams, Miller, and Albee</b>	4 Cl.; 4 Q.H.
The American playwright reflecting the current social, philosophical, psychological dilemma.	
<b>29.230 Contemporary Theatre</b>	4 Cl.; 4 Q.H.
The contemporary forces that shape the trends in the present day theatre with an emphasis upon the works and ideas of O'Neill, Wilder, Pirandello, Lorca, Brecht, Beckett, Ionesco, Genet, Pinter, and Albee.	
<b>29.231 The Theatre of the Absurd</b>	4 Cl.; 4 Q.H.
The Theatre of the Absurd as a mirror of present Existentialist thinking and its effects upon the history of Western Drama.	
<b>29.240 Drama Criticism</b>	4 Cl.; 4 Q.H.
The development of modern dramatic theory and criticism through the work of the chief drama critics of the past, with special attention to the rise of journalistic play reviewing and its role in criticism.	
<b>29.280 Senior Project</b>	4 Cl.; 4 Q.H.
A final project required of each senior student within the major to demonstrate his proficiency and creativeness in one area of the theatre arts: play-writing, design, directing.	

## English Department

### Professors

Everett C. Marston, A.B., M.A.,  
Acting Chairman  
James T. Barrs, A.B., A.M., Ph.D.  
Victor E. Howes, A.B., M.A., Ph.D.  
Samuel F. Morse, A.B., A.M., Ph.D.  
Franklin Norvish, S.B., M.A.

### Associate Professors

Raymond E. Blois, B.S., M.A., Ph.D.  
George Khiralla, S.B., A.M.  
William H. Reynolds, B.S., M.A.  
Lloyd A. Skiffington, B.A., M.A.

### Assistant Professors

Samuel J. Bernstein, B.A., M.A., Ph.D.  
Donald R. Berry, B.A., M.A.  
Gerald R. Griffin, B.A., M.A.  
John Kazantzi, A.B., M.A., Ph.D.

### Assistant Professors (continued)

John H. Martin, B.A., M.A., Ph.D.  
Alan R. Rosen, B.A., M.A.  
John F. Santas, B.A., M.A., Ph.D.  
Hassell B. Sledd, B.A., M.A., Ph.D.  
Harvey Vetstein, B.A., M.A.  
Gerald M. Weisenberg, A.B., M.A.

### Instructors

Leonard G. Abram, B.S., M.A.  
Robert M. Arlett, B.A., M.A.  
Frederick Calatrello, A.B., M.A.  
Joseph B. DeRoche, B.A., M.F.A.  
Richard Elia, A.B., M.A.  
Judith R. Goodman, B.A., M.A.  
James E. Hanley, B.S., M.A.  
Theodore J. Love, A.B., M.A.  
Dennis B. McCormick, B.A., M.A.  
Robert L. Trew, B.A., M.A.  
Mary B. Wilk, B.S., M.A.

**30.101 English**

3 CI.; 3 Q.H.

Important principles of logic and rhetoric applied to exposition and argumentation writing; review of sentence structure, punctuation, and paragraphing; extensive reading and analysis of the essay form; theme assignments.

**30.102 English**

Prereq. 30.101; 3 CI.; 3 Q.H.

Preparation, organization, and documentation of student reports and critical essays; practice in library research; study of scholarship in, and interpretation of, classical novels.

**30.103 English**

Prereq. 30.102; 3 CI.; 3 Q.H.

Introduction to literature; aims and techniques of the short story, drama, and poetry; the writing of short literary critiques.

**30.104 Intermediate Writing**

Prereq. 30.101, 30.102, 30.103 or equiv.; 4 CI.; 4 Q.H.

The development of various skills to increase command of written language; practice in using experience as a source of materials for writing; reading and analysis of student papers and selected examples of professional writing. Composition includes exercises in characterization, mood, dialogue, sensory details, situation, personal essay, short short story, dramatic sketches.

**30.105 Intermediate Writing**

Prereq. 30.104; 4 CI.; 4 Q.H.

Analysis of literary techniques of prose and poetry; completion of 10,000 words of manuscript; development of the imagination through exercises in shaping experience; discussion of student papers. Composition includes poetry, short story, drama, novelette.

**30.108 Advanced Composition**

4 CI.; 4 Q.H.

The writing of poetry; practice in various forms and strategies of verse, with specific assignments in different modes; discussion and criticism of student work and selected texts.

**30.109 Advanced Composition**

Prereq. 30.108; 4 CI.; 4 Q.H.

The writing of fiction; practice in the writing of fiction, including some longer forms; discussion and criticism of student work and selected texts.

**30.110 Literary Analysis, Poetry**

4 CI.; 4 Q.H.

Close reading of selected poems, mastery of critical terms, practice in varied critical approaches to poetry. A number of critical papers will be written. Required of English majors.

**30.111 Literary Analysis, Novel**

4 CI.; 4 Q.H.

A formal study of selected novels, mastery of critical terms, practice in varied critical approaches. A number of critical papers will be written. English majors are required to take either 30.111 or 30.112.

**30.112 Literary Analysis, Drama**

4 CI.; 4 Q.H.

A formal study of selected plays, mastery of critical terms, practice in varied critical approaches. A number of critical papers will be written. English majors are required to take either 30.112 or 30.111.

**30.120 Introduction to Linguistics** 4 Cl.; 4 Q.H.  
 Nature and origin of language; both distinctive and shared features of the Indo-European languages; general phonetics; Grimm's and Verner's laws; effects of stress; economy of effort; analogy; borrowings; etymology, etc.

**30.121 Foundations of the English Language** 4 Cl.; 4 Q.H.  
 Development of Modern English from pre-Anglo-Saxon beginnings; effects of the Scandinavian invasions and of the Norman Conquest; changes in phonology, morphology, syntax, and meanings; sources of the vocabulary; the making of words; dialectology; English as an international language; the problem of spelling.

**30.124 Traditional Grammar** 4 Cl.; 4 Q.H.  
 A reappraisal of traditional grammar in the light of recent advances in grammatical theory; the practical application of such grammar in both studying and teaching English as a medium of expression; supplementary readings by way of transition to the newer grammars.

**30.125 Grammatical Analysis** 4 Cl.; 4 Q.H.  
 An attempt to understand and apply the newer grammar, especially the structural.

**30.130 Introduction to Semantics** 4 Cl.; 4 Q.H.  
 The relation between language and behavior; levels of abstraction in communication; habits of evaluation of linguistic phenomena, and the modification of such habits in the direction of human understanding and survival.

**30.145 Masterpieces of Literature** 3 Cl.; 3 Q.H.  
 Western man's aesthetic experience in literature, with tragedy as the unifying theme.

**30.149 Shakespearean Plays** 5 Cl.; 2.5 Q.H.  
 Four Shakespearean plays are read and discussed with special attention to character, motivation, situation, and adaptation to the Elizabethan stage.

**30.150 Shakespearean Plays** 3 Cl.; 3 Q.H.  
 Four Shakespearean plays are read and discussed with special attention to character, motivation, situation, and adaptation to the Elizabethan stage.

**30.151 The Modern Novel** 4 Cl.; 4 Q.H.  
 Outstanding novels of the 20th century, with emphasis on literary trends and implied social outlook.

**30.152 Modern Drama** 4 Cl.; 4 Q.H.  
 Native and European drama since 1880, with emphasis on the relationship between drama and society in the 20th century.

**30.153 American Literature** 3 Cl.; 3 Q.H.  
 Outstanding works in American literature in their relation to social and intellectual backgrounds.

**30.170 Survey of English Literature** 4 Cl.; 4 Q.H.  
English literature to 1800. (Not open to students taking 30.174, 30.175.)

**30.171 Survey of English Literature** 4 Cl.; 4 Q.H.  
English literature from 1800 to the present. (Not open to students taking 30.176, 30.177.)

**30.174 English Literature I** Prereq. 30.110; 4 Cl.; 4 Q.H.  
English literature from Beowulf to Spenser. Required of English majors.

**30.175 English Literature II** Prereq. 30.110, 30.111 or 30.112; 4 Cl.; 4 Q.H.  
English literature from Shakespeare to Dryden. Required of English majors.

**30.176 English Literature III** Prereq. same as 30.175; 4 Cl.; 4 Q.H.  
English literature from Pope to Byron. Required of English majors.

**30.177 Survey of English Literature IV** Prereq. same as 30.175; 4 Cl.; 4 Q.H.  
English literature from Tennyson to T. S. Eliot. Required of English majors.

**30.180 Survey of American Literature** 4 Cl.; 4 Q.H.  
American literature to 1860. (Not open to students taking 30.184.)

**30.181 Survey of American Literature** 4 Cl.; 4 Q.H.  
American literature from 1860 to the present. (Not open to students taking 30.185.)

**30.182 Major American Novels** 4 Cl.; 4 Q.H.  
An intensive analysis of the themes, forms, and techniques of nine novels by four American novelists of the nineteenth and early twentieth centuries, with special emphasis on James. Critical papers will be required.

**30.183 Major American Novels** Prereq. 30.182 or the Instructors consent. 4 Cl.; 4 Q.H.  
An intensive analysis of the themes, forms, and techniques of nine modern novels by four American novelists, with special emphasis on Faulkner. Critical papers will be required.

**30.184 American Literary Figures** Prereq. 30.110 and 30.111 or 30.112; 4 Cl.; 4 Q.H.  
A detailed study of selected American authors from Colonial times and the mid-nineteenth century.

**30.185 American Literary Figures** Prereq. same as 30.184; 4 Cl.; 4 Q.H.  
A detailed study of selected American authors from the mid-nineteenth century to the present.

**30.195, 30.196, 30.197 Advanced Placement for Freshmen** 3 Q.H.

**30.200 Western World Literature I** 4 Cl.; 4 Q.H.  
A study of major literary forms of classical Greece, especially the epic, drama, and dialogue, authors such as Homer, Plato, Aristotle, the dramatists.

**30.201 Western World Literature II** 4 Cl.; 4 Q.H.  
 A study of major literary forms of the ancient Roman Empire, especially the epic, drama, and oration. Readings from such writers as Vergil, Horace, Ovid, Cicero.

**30.202 Western World Literature III** 4 Cl.; 4 Q.H.  
 A study of major literary forms in the European tradition from the medieval period to the 19th century. Readings from such writers as Dante, Calderón, Milton, Racine, Corneille, Johnson, and Goethe.

**30.203 Western World Literature IV** 4 Cl.; 4 Q.H.  
 A study of major trends and literary forms of the twentieth century, European and American. Readings from such writers as Kafka, Camus, Sartre, Ionesco, Becket, and Albee.

**30.210 Major British Novelists** 4 Cl.; 4 Q.H.  
 The eighteenth century English novel, with special attention to Defoe, Fielding, Smollett, Sterne, the Gothic novelists, and Austen; the development of the English novel and the characteristic quality of eighteenth century fiction.

**30.211 Major British Novelists** 4 Cl.; 4 Q.H.  
 The nineteenth century English novel, with special attention to the Brontës, Thackeray, Trollope, Eliot, Meredith, Gissing, and Hardy; the Victorian frame of mind, as seen in the novels.

**30.216 Topics in the Modern Novel** 4 Cl.; 4 Q.H.  
 Intensive study of literary and intellectual traditions from the point of view of selected twentieth century writers. The works emphasize the power of spiritual insight and question the position of modern man in the universe. Among writers discussed will be Dostoevsky, Conrad, Kafka, Salinger, Hemingway, Forster, Woolf, and Huxley.

**30.217 Topics in the Modern Novel** 4 Cl.; 4 Q.H.  
 Attempts to apply similar analyses and studies of the aesthetic forms by which the artist presents his vision of life. Among writers discussed will be James, Lawrence, Greene, Joyce, Faulkner, Updike, Amis, Durrell.

**30.220 Major British Dramatists** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
 The origins, themes, form, techniques and poetry of Elizabethan and Jacobean drama in such dramatists as Kyd, Webster, Tourneur, Fletcher and Beaumont, with particular emphasis on the works of Marlowe, Jonson and Ford.

**30.221 Major British Dramatists** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
 Contemporary British drama with particular emphasis on the poetic and experimental in the works of Shaw, Synge, Yeats, O'Casey, Eliot, Behan, Pinter and Beckett.

**30.222 Chaucer** Prereq. 2 courses in lit.; Cl. 4; 4 Q.H.  
 Chaucer's early poems and selected *Canterbury Tales*.

**30.223 Chaucer** Prereq. 30.222; 4 Cl.; 4 Q.H.  
 Selected *Canterbury Tales* and portions of *Troilus*.

**30.224 Spenser** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
Selected early poems and portions of the *Faerie Queene*.

**30.225 Milton** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
Concentration on Milton's *Paradise Lost* with supplementary readings in his minor poems and prose.

**30.230 Seventeenth Century English Literature** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
Major writers of the first half of the century with special emphasis on Bacon, Jonson and the metaphysical poets, Donne and Herbert; the effect of science on the literature and the thinking of the times.

**30.231 Seventeenth Century English Literature** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
Major writers of the second half of the century with emphasis upon Dryden and Milton. Satire as a literary genre, and its relationship to the times.

**30.236 Eighteenth Century English Literature** 4 Cl.; 4 Q.H.  
Significant dramatic works of the period and the writings of Pope and Swift are treated.

**30.237 Eighteenth Century English Literature** 4 Cl.; 4 Q.H.  
Writings of Dr. Johnson, Boswell, and Blake.

**30.240 Nineteenth Century English Literature** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
The poetry of Blake, Wordsworth, Coleridge, Shelley and Keats and some related critical material; the relationship between the poetry and the time.

**30.241 Nineteenth Century English Literature** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
The poetry of Victorian England with special emphasis upon that of Tennyson and Browning; reading of related critical material; the relationship between the poetry and the time.

**30.246 Twentieth Century Literature** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
The modern movement in English and American literature from 1890 to 1920, against its background and its context of symbolism, naturalism, expressionism, and other related movements. Writers to be studied include H. G. Wells, Arnold Bennett, the early Yeats, the early Frost and the Georgian and Imagist Poets.

**30.247 Twentieth Century Literature** Prereq. 2 courses in lit.; 4 Cl.; 4 Q.H.  
The modern movement in English and American literature from 1920 to the present. Writers to be studied include Hemingway, Fitzgerald, Faulkner, Yeats, Virginia Woolf, Frank O'Connor, Stevens, W. C. Williams, Auden, Thomas, the "angry generation," the "new" poets, and fiction writers since World War II.

**30.250 Shakespeare** 4 Cl.; 4 Q.H.  
A chronological approach to Shakespeare's plays, beginning with *Romeo and Juliet* and ending with *Julius Caesar*. Emphasis on diction, dramatic structure and psychology.

<b>30.251 Shakespeare</b>	4 Cl.; 4 Q.H.
Shakespeare's middle and last phases; <i>Hamlet</i> to <i>The Tempest</i> ; selected plays.	
<b>30.260 The Bible</b>	4 Cl.; 4 Q.H.
Selected books of the Bible considered in their literary and historical aspects.	
<b>30.261 The Literature of Biography</b>	4 Cl.; 4 Q.H.
English literature contains a wide variety of excellent biographies and auto-biographies. Selected specimens of this form ranging chronologically from John Aubrey to Lytton Strachey.	
<b>30.262 Literary Criticism</b>	4 Cl.; 4 Q.H.
An introduction to the leading schools of literary criticism.	
<b>30.280 Senior Seminar</b>	2 Cl.; 2 Q.H.
The writings of significant American dramatists are studied in order to help the student to develop an understanding and appreciation of American drama. Attention is paid to developing the student's ability to do individual research.	
<b>30.281 Senior Seminar</b>	2 Cl.; 2 Q.H.
The writings of significant American dramatists are studied in order to help the student to broaden and deepen his understanding and appreciation of American drama. Attention is paid to improving the student's ability to do individual research.	
<b>30.295, 30.296, 30.297, 30.298 Honors Program</b>	(each) 4 Q.H.
See page 101.	

## Modern Languages Department

### Professors

Louis Cooperstein, Chairman,  
A.B., A.M.  
Antonio L. Mezzacappa, A.B., M.A., Ph.D.

### Associate Professors

Israel Aluf, B.A., M.A., Ph.D.  
Benedetto Fabrizi, B.S., M.A., D.M.L.  
Samuel Jaramillo, Ph.D.  
Philip H. Stephan, B.A., B.A., Ph.D.  
Edward B. Williams, A.B., A.M., Ph.D.

### Assistant Professor

John Spiegel, B.A., M.A.

### Instructors

Elizabeth Boehme, A.B., M.A.  
Raquel M. Halty, A.B.  
Robert B. Modee, B.A., M.A.  
Berta Riesco, Ed.D.  
Mary M. Rowan, B.A., M.A.  
Harry C. Snyder, Jr., B.A., M.A.  
Eleanor C. Taglieri, B.A., M.A.  
Briana Thompson, B.A., M.A.  
Francis Thompson, B.A., M.A.

## FRENCH

<b>31.101 Elementary French</b>	3 Cl.; 3 Q.H.
Essentials of grammar; practice in pronunciation; and progressive acquisition of a basic vocabulary and idiomatic expressions.	

**31.102 Elementary French** Prereq. 31.101; 3 Cl.; 3 Q.H.  
Continuation of grammar study. Oral and written exercises.

**31.103 Elementary French** Prereq. 31.102; 3 Cl.; 3 Q.H.  
Reading of French prose of increasing difficulty, with written and oral exercises based on the material read; practice in conversation.

**31.111 Intermediate French**  
Course for freshmen who have had two or three years of high school French. A review of grammar with practice in composition and conversation.

**31.112 Intermediate French** Prereq. 31.111; 3 Cl.; 3 Q.H.  
History of French civilization with discussions and conversation.

**31.113 Intermediate French** Prereq. 31.112; 3 Cl.; 3 Q.H.  
Intensive reading of modern French prose, with conversational practice.

**31.115 Intermediate French** Prereq. 31.103 or 31.152; 4 Cl.; 4 Q.H.  
Course for upperclassmen. Review of grammar. History of French civilization, with discussions and conversation.

**31.116 Intermediate French** Prereq. 31.115; 4 Cl.; 4 Q.H.  
Intensive reading of modern French prose, with conversational practice.

**31.117 French Composition and Conversation**  
Prereq. 31.113 or 31.116; 4 Cl.; 4 Q.H.  
General grammar review; written work; and conversation.

**31.118 French Composition and Conversation** Prereq. 31.117; 4 Cl.; 4 Q.H.  
Free composition; oral reports; and class discussions.

**31.119 French Literature in the Twentieth Century**  
Prereq. 31.113 or 31.116; 4 Cl.; 4 Q.H.  
Narrative and dramatic prose from 1900 to the present. Among writers included are Colette, Duhamel, Renard, Rolland, Proust, and Anatole France.

**31.120 French Literature in the Twentieth Century**  
Prereq. 31.113 or 31.116; 4 Cl.; 4 Q.H.  
Recent French literature as illustrated by Gide, Mauriac, Camus, Satre, and others.

**31.121 French Literature in the Nineteenth Century**  
Prereq. 31.113 or 31.116; 4 Cl.; 4 Q.H.  
Origin and development of the Romantic movement in France; selected poems by Lamartine, Hugo, Musset, and Vigny; characteristic Romantic prose and drama.

**31.122 French Literature in the Nineteenth Century**  
Prereq. 31.113 or 31.116; 4 Cl.; 4 Q.H.  
Parnassian and Symbolist poetry; the Realistic and Naturalistic novel; the plays of Dumas fils, Augier, Becque, and Rostand.

**31.123 French Classicism** Prereq. 31.113 or 31.116; 4 Cl.; 4 Q.H.  
 Background and non-dramatic literature of the seventeenth century; selections from Malherbe, Descartes, Pascal, La Fontaine, Mme. de Sévigné, Mme. de La Fayette, Bossuet, and Fénelon.

**31.124 French Classicism** Prereq. 31.113 or 31.116; 4 Cl.; 4 Q.H.  
 Dramatic theories, especially by Boileau; plays by Corneille, Molière, and Racine.

**31.127 Survey of French Literature** Prereq. 4 yrs. of high school French; 3 Cl.; 3 Q.H.  
 Medieval masterpieces in modern French versions, with emphasis on the *Chanson de Roland*, *Tristan et Iseut*, and the novels of Chrétien de Troyes.

**31.128 Survey of French Literature** Prereq. 30.127; 3 Cl.; 3 Q.H.  
 French Literature of the fifteenth and sixteenth centuries, with particular attention to Villon, Rabelais, Montaigne and the poets of the Pléiade.

**31.129 Survey of French Literature** Prereq. 31.128; 3 Cl.; 3 Q.H.  
 Brief discussion of the seventeenth century; the writings of the "philosophers," particularly Diderot and Voltaire, with some attention to Rousseau, Beaumarchais, and André Chénier.

**31.130 Applied French Linguistics** Prereq. 30.120; 4 Cl.; 4 Q.H.  
 For teachers or prospective teachers of French. Phonemes and allophones; breath groups and sentences; intonation patterns; comparison between oral and written French.

**31.151 Elementary French**  
 Course for upperclassmen. Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

**31.152 Elementary French** Prereq. 31.154; 4 Cl.; 4 Q.H.  
 Continuation of grammar study; oral and written exercises; reading of French prose of increasing difficulty; practice in conversation.

**31.165 Intermediate French**  
 Prereq. 2-3 yrs. high school French or 31.103 or 31.152; 3 Cl.; 3 Q.H.  
 French civilization through texts of average difficulty; written and oral exercises.

**31.166 Intermediate French** Prereq. 31.165; 3 Cl.; 3 Q.H.  
 Intensive reading of modern French prose, with conversation practice.

**31.295, 31.296, 31.297, 31.298; Honors Program** (each) 4 Q.H.  
 See page 101.

**SPANISH****32.101 Elementary Spanish**

3 Cl.; 3 Q.H.

Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

**32.102 Elementary Spanish**

Prereq. 32.101; 3 Cl.; 3 Q.H.

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty.

**32.103 Elementary Spanish**

Prereq. 32.102; 3 Cl.; 3 Q.H.

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty.

**32.111 Intermediate Spanish**

3 Cl.; 3 Q.H.

Intermediate course for freshmen who have had two or three years of high school Spanish. Review of grammar, with practice in composition and conversation.

**32.112 Intermediate Spanish**

Prereq. 32.111; 3 Cl.; 3 Q.H.

Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings.

**32.113 Intermediate Spanish**

Prereq. 32.112; 3 Cl.; 3 Q.H.

Spanish-American civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings.

**32.115 Intermediate Spanish**

Prereq. 32.103 or 32.152; 4 Cl.; 4 Q.H.

Spanish civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral and written translation; conversation practice based on assigned readings.

**32.116 Intermediate Spanish**

Prereq. 32.115; 4 Cl.; 4 Q.H.

Spanish-American civilization through texts of average difficulty. Intensive reading of modern prose, with occasional oral or written translation; conversation practice based on assigned readings.

**32.117 Spanish Composition and Conversation**

Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.

Practice in writing and speaking Spanish, including written and oral résumés, prepared speeches and themes, impromptu speaking and writing; a review of the more subtle problems of grammar.

**32.118 Spanish Composition and Conversation**

Prereq. 32.117; 4 Cl.; 4 Q.H.

Further practice in oral and written Spanish; continued study of problems of advanced Spanish grammar.

**32.119 Spanish American Literature** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
Early Latin American literature; the literature of the colonial period and the early nineteenth century based primarily on selections from an anthology.

**32.120 Spanish American Literature** Prereq. 32.119; 4 Cl.; 4 Q.H.  
Modern Latin American literature; readings from the modernistic period: selections from the prose of Rodó, Gallegos, Alegria, Quiroga, Azuela, and others.

**32.121 A Survey of Medieval Spanish Literature** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
Selections from the *Poema de Mío Cid*, *Alfonso XII*, *Gonzalo de Berceo*, *El Arcipreste de Hita*, *La Celestina*; and others.

**32.122 Fifteenth and Sixteenth Century Spanish Literature** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
Selections from the romancero (ballads), Garcilasso de la Vega, Fray Luis de León, San Juan de la Cruz, Santa Teresa, and the picaresque novel.

**32.123 Literature of the Golden Age** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
Cervantes; selections from the *Entremeses*, the *Novelas Ejemplares*, and *Don Quijote*, with emphasis on the latter as Spain's greatest literary masterpiece.

**32.124 Literature of the Golden Age** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
Readings from the *comedias* of Lope de Vega, Tirso de Molina, Calderón, and Ruiz de Alarcón; also prose and poetry selections of Góngora and Quevedo.

**32.125 Nineteenth Century Spanish Literature** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
Readings in prose, poetry, and drama of the romantic period, including selections from El Duque de Rivas, Larra, Espronceda, Zorrilla, and Bécquer.

**32.126 Nineteenth Century Spanish Literature** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
The realistic period; prose and drama selections from the works of Echegaray, Tamayo y Baus, Alarcón, Pereda, Valera, Galdós, and Clarín.

**32.127 Twentieth Century Spanish Literature** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
Selections from the writings of the Generation of '98: Unamuno, Valle-Inclán, Pío Baroja, Benavente, Azorín, and the Machado brothers.

**32.128 Twentieth Century Spanish Literature** Prereq. 32.113 or 32.116; 4 Cl.; 4 Q.H.  
Prose and poetry of modern writers, such as Ortega y Gasset, Pérez de Ayala, García Lorca, Juan Ramón Jiménez, Gironella, and José Cela.

**32.151 Elementary Spanish**

4 Cl.; 4 Q.H.

Course for upperclassmen. Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

**32.152 Elementary Spanish**

Prereq. 32.151; 4 Cl.; 4 Q.H.

Continuation of grammar study. Oral and written exercises; reading of Spanish prose of moderate difficulty.

**GERMAN****33.101 Elementary German**

3 Cl.; 3 Q.H.

Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary and idiomatic expressions.

**33.102 Elementary German**

Prereq. 33.101; 3 Cl.; 3 Q.H.

More difficult points of grammar, particularly uses of subjunctive mood.

**33.103 Elementary German**

Prereq. 33.102; 3 Cl.; 3 Q.H.

Reading of simple German prose, with oral and written exercises based on material read; German conversation encouraged.

**33.111 Intermediate German**

3 Cl.; 3 Q.H.

Intermediate course for freshmen who have had two or three years of high school German. A review of grammar; practice in composition and conversation.

**33.112 Intermediate German**

Prereq. 33.111; 3 Cl.; 3 Q.H.

History of German civilization, with discussions and conversation.

**33.113 Intermediate German**

Prereq. 33.112; 3 Cl.; 3 Q.H.

Intensive reading of modern German prose, with conversational practice.

**33.115 Intermediate German**

Prereq. 33.101, 33.102, 33.103; 4 Cl.; 4 Q.H.

German civilization through texts of average difficulty; review of grammar; written and oral exercises.

**33.116 Intermediate German**

Prereq. 33.115; 4 Cl.; 4 Q.H.

Readings from modern German prose; conversational practice.

**33.117 German Composition and Conversation**

Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.

Grammar review; written work; German conversation.

**33.118 German Composition and Conversation**

Prereq. 33.117; 4 Cl.; 4 Q.H.

Free composition; oral reports; class discussions.

**33.119 Scientific German** Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.  
Review of grammar; readings in scientific German: articles dealing with chemistry, physics, mathematics and biology.

**33.120 The German Lyric** Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.  
German lyric poetry from the twelfth century to the present; analysis of selected poems; reports; discussions.

**33.121 The Works of Goethe** Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.  
Dramas, prose writings, and lyric poetry of Goethe; lectures, collateral readings; reports.

**33.122 Classical Period of German Literature** Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.  
Background and general survey of the period from 1750 to 1800, with particular emphasis on the works of Lessing and Schiller.

**33.123 German Drama of the Nineteenth Century** Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.  
Plays by Kleist, Hebbel, Grillparzer, and Ludwig; lectures; collateral readings; reports.

**33.124 Nineteenth Century German Literature** Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.  
Background and general survey of German literature in the nineteenth century, with particular attention to prose and lyric poetry.

**33.125 German Drama of the Twentieth Century** Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.  
Plays by Schnitzler, Hofmannsthal, Wedekind, Kaiser, Toller, Unruh, and Wiechert.

**33.126 German Literature of the Twentieth Century** Prereq. 33.113 or 33.116; 4 Cl.; 4 Q.H.  
Recent German literature, particularly prose and lyric poetry.

**33.151 Elementary German** 4 Cl.; 4 Q.H.  
Course for upperclassmen. Essentials of grammar; practice in pronunciation; acquisition of a basic vocabulary; idiomatic expressions.

**33.152 Elementary German** Prereq. 33.151; 4 Cl.; 4 Q.H.  
More difficult points of grammar; reading of simple German prose, with oral and written exercises.

**33.165 Intermediate German** Prereq. 2-3 yrs. high school German or 33.103 or 33.152; 3 Cl.; 3 Q.H.  
German civilization through texts of average difficulty; written and oral exercises.

**33.166 Intermediate German** Prereq. 33.165; 3 Cl.; 3 Q.H.  
Readings from modern German prose; conversation practice.

**RUSSIAN**

**34.101 Elementary Russian** 3 CI.; 3 Q.H.  
 Essentials of grammar; practice in pronunciation and progressive acquisition of a basic vocabulary; idiomatic expressions.

**34.102 Elementary Russian** Prereq. 34.101; 3 CI.; 3 Q.H.  
 Continuation of grammar study; oral and written exercises.

**34.103 Elementary Russian** Prereq. 34.102; 3 CI.; 3 Q.H.  
 Reading of Russian prose of moderate difficulty.

**34.115 Intermediate Russian** Prereq. 34.103 or 34.152; 4 CI.; 4 Q.H.  
 Graded reading from the works of Pushkin, Lermontov and Turgenev; oral and written practice based on the covered material.

**34.116 Intermediate Russian** Prereq. 34.115; 4 CI.; 4 Q.H.  
 Russian history and civilization through texts of average difficulty; oral practice and composition based on covered material.

**34.117 Russian Composition and Conversation** Prereq. 34.116; 4 CI.; 4 Q.H.  
 Written and oral themes based on everyday situations and on current articles from the Soviet and Western press.

**34.118 Russian Composition and Conversation** Prereq. 34.117; 4 CI.; 4 Q.H.  
 Continuation of 34.117.

**34.119 Scientific Russian** Prereq. 34.116; 4 CI.; 4 Q.H.  
 Reading of selected Russian texts dealing with chemistry, physics, mathematics, and biology.

**34.120 Russian Expository Prose** Prereq. 34.116; 4 CI.; 4 Q.H.  
 Readings of lectures, speeches, essays, and critical studies by outstanding Russian scholars.

**34.121 The Russian Short Story** Prereq. 34.116; 4 CI.; 4 Q.H.  
 The evolution of this genre; readings of the finest short stories of nineteenth and twentieth century authors.

**34.122 The Russian Drama** Prereq. 34.116; 4 CI.; 4 Q.H.  
 The evolution of this genre; readings of the representative plays of nineteenth and twentieth century playwrights.

**34.123 Russian Folklore** Prereq. 34.116; 4 CI.; 4 Q.H.  
 Presentation of the development of the various genres of folk literature through lectures, readings, and tape recordings.

**34.124 Highlights of Russian Poetry** Prereq. 34.116; 4 CI.; 4 Q.H.  
 Reading and analysis of selected poems by classical and modern authors.

**34.151 Elementary Russian** 4 Cl.; 4 Q.H.

Course for upperclassmen. Essentials of grammar; practice in pronunciation; progressive acquisition of a basic vocabulary; idiomatic expressions.

**34.152 Elementary Russian** Prereq. 34.151; 4 Cl.; 4 Q.H.

Continuation of grammar study. Oral and written exercises; reading of Russian prose of moderate difficulty.

**34.165 Intermediate Russian**

Prereq. 2-3 years high school Russian, 34.103 or 34.152; 3 Cl.; 3 Q.H.

Graded readings from the works of Pushkin, Lermontov and Turgenev; oral and written practice based on material covered.

**34.166 Intermediate Russian** Prereq. 34.165; 3 Cl.; 3 Q.H.

Russian history and civilization through texts of average difficulty; oral practice and composition based on material covered.

## Journalism Department

**Associate Professor****Instructors**

George A. Speers, Chairman,  
A.B., M.S., M.Ed.

Allen F. Azer, B.A., M.S.  
Edward F. Quarrington, A.B.

**38.101 History and Principles of Journalism** 4 Cl.; 4 Q.H.

Development of American journalism from European and English beginnings; the problems and contributions of the "Colonial Press," the Revolutionary War period, the "Party Press," the "Penny Press," and the leading contributions to early American journalism; the evolution of freedom of the press and the concurrent responsibility of the press media to this freedom; some writing.

**38.102 History and Principles of Journalism** 4 Cl.; 4 Q.H.

A continuation of 38.101 from mid-nineteenth century; America's great personal journalists and mass circulation "giants" and their contributions: Greeley, Bennett, Raymond, Dana, Grady, Nelson, Ochs, White, Medill, Pulitzer, Hearst, Scripps, Howard, McCormick and others; the relationships of journalism to such events as the Civil War, the Spanish American War; the unfolding principles; some writing.

**38.103 Fundamentals of Newswriting** 4 Cl.; 4 Q.H.

Functions of the editorial department and procedures in obtaining and writing news stories; extensive practice in writing news stories.

**38.104 Fundamentals of Newswriting**

Prereq. 38.103 or consent of instructor; 4 Cl.; 4 Q.H.

Problems of reporting and news writing with written assignments in various types of spot news reporting.

**38.105 Techniques of Journalism**

Prereq. 38.104 or consent of instructor; 4 Cl.; 4 Q.H.

Advanced practice in writing news stories along with editorials, feature stories, criticisms, etc.

**38.106 Techniques of Journalism**

Prereq. 38.105 or consent of instructor; 4 Cl.; 4 Q.H.

Editing the news with practice in copy editing, headline writing, and newspaper makeup.

**38.107 The Press and Society**

2 Cl.; 2 Q.H.

The relationships of the press media to American society; the various roles of the press; the unfolding legislative pattern before and after the First Amendment; some outstanding court cases concerning the press such as contempt of court, licensing, taxing the press; relationships between the press and the U.S. Post Office. A study project, working with professional newspapers, is required.

**38.108 The Press and Society**

2 Cl.; 2 Q.H.

Some of the major legal considerations concerning the press media, such as libel and slander, right of privacy, the public's "right to know"; some current and past restrictive legislation; the growing specialization of the press, including new aspects of it, such as public relations and publicity. A study project, working with professional newspapers, is required.

## Economics Department

**Professors**

Morris A. Horowitz, Chairman,  
B.A., Ph.D.  
Irwin L. Herrnstadt, B.A., Ph.D.  
G. Donald Shelby, B.A., Ph.D.

**Assistant Professors**

James W. Meehan, Jr., B.A., Ph.D.  
Peter V. Mini, B.S., Ph.D.  
Prabuddha Nath Roy, B.A., M.A.  
Donald J. Wheaton, B.S., M.A.

**Associate Professors**

Conrad P. Caligaris, B.B.A.,  
M.A., Ph.D.  
Ernest M. DeCicco, B.S., A.M., Ph.D.  
Harold M. Goldstein, A.B., M.A., Ph.D.  
Sidney Herman, B.S., M.A.  
Ivory L. Lyons, A.B., A.M., Ph.D.  
Gustav Schachter, B.S., M.B.A., Ph.D.

**Instructors**

James W. Dean, B.Sc.  
James W. Doane, A.B.  
Harris E. Hordon, B.A., M.A.  
Richard K. Skillman, A.B., M.A.,  
M.A.L.D.

**39.101 Introduction to Economic Resources**

3 Cl.; 3 Q.H.

The location and functioning of economic activity; the production, exchange, and consumption of goods by people in different parts of the world.

**39.102 Introduction to Economic Growth and Development**

Prereq. 39.101; 3 Cl.; 3 Q.H.

Presentation of a general framework for examining, through a historical survey, the rise and development of the Western market system; the phenomenon

of economic growth which is central to the field of economic development; the alternative approaches to economic development.

**39.103 Introduction to Economic Institutions** Prereq. 39.102; 3 Cl.; 3 Q.H.

Introduction to the economic institutions that are characteristic of the American economy so that the student may understand the fundamental economic problems and policy alternatives society may utilize to contend with these problems; emphasis on the role of the business sector, labor, the consumer, as well as the economic functions of the government.

**39.104 Introduction to Economic Growth and Development and Economic Institutions** 4 Cl.; 4 Q.H.

An examination, through a historical survey, of the rise and development of the Western market system; economic growth and the alternative approaches to economic development; the economic institutions that are characteristic of the American economy; fundamental economic problems and policy alternatives that our society may utilize to contend with these problems.

**39.105 Principles of Economics** Prereq. 39.103 or 39.104; 3 Cl.; 3 Q.H.

Development of macro-economic analysis; review of national income accounting and concepts; national income determination, fluctuation, and growth; contraction and expansion analyzed through the circular flow of money payments; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade: balance of international payments, law of comparative advantage, tariff protection versus free trade.

**39.106 Principles of Economics** Prereq. 39.105; 3 Cl.; 3 Q.H.

Comprehensive analysis of the economics of the firm with illustrative cases. Demand, cost and output relationships examined under marginal analysis and alternatives, such as break-even charts, cost-plus pricing and sales maximization. Market structures, factors of production, and investment given special treatment. Market structures and the public interest includes examination of anti-trust policy, economic efficiency, research and innovation, advertising, and economic concentration. Some emphasis placed on theory versus practice.

**39.115 Principles and Problems of Economics** 4 Cl.; 4 Q.H.

An introduction to the conceptual aspects of economics. The flow of national income; economic growth and fluctuations; the role of money and banking; monetary and fiscal policies; emphasis on developing conceptual tools for use in the analysis of economic problems facing modern society.

**39.116 Principles and Problems of Economics** 4 Cl.; 4 Q.H.

A continuation of the approach developed in 39.115 but oriented to the particular roles of consumer, labor, business firms, government, agriculture and other segments of the modern economy; the international economy and differences between economic systems; emphasis on the understanding of how the pricing system determines resource allocation, production efficiency and the distribution of income.

**39.125 Economics** 3 Cl.; 3 Q.H.

Macro-economic problems, theory and policy; basic economic concepts and

the institutional setting of the American economic system, its goals and problems; national income and product definition and measurement; the theory of income determination; the relation between prices and money; the mechanics of commercial banking operations, central banking and monetary policy; government and fiscal policy; appraisal of stabilization policies; economic growth theory and problems.

### **39.126 Economics**

3 Cl.; 3 Q.H.

Micro-economics: the pricing of national output and distribution of national income; the theory of demand and utility; the economics of the firm; cost and supply; partial equilibrium analysis; price determination under various market structures; the theory of production; the pricing of productive factors in various market structures; international economic problems and policies; the theory of international trade; the balance of payments; current international economic problems.

### **39.250 Statistics**

Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

This course builds from a base of descriptive statistics (control tendency, dispersion, grouped and ungrouped data, etc.) toward an introductory level of statistical inference (sampling, probability, expected value, probability distributions and statistical estimation); emphasis on business decision-making under uncertainty and on the key role of probability theory which enables us to use sampling data to estimate unknown parameters with measurable risk of error.

### **39.251 Statistics**

Prereq. 39.250; 4 Cl.; 4 Q.H.

Continuation of investigation of decision-making under uncertainty; continuation in field of statistical inference wth hypothesis testing, quality control charts, regression-correlation analysis, and time series analysis.

### **39.255 Micro-economic Theory**

Prereq. 39.116 or 30.106; 4 Cl.; 4 Q.H.

A detailed study of supply and demand analysis; various elasticity concepts and applications; theory of consumer demand; theory of production; derivation of cost curves; detailed analysis of pricing; and output behavior in the several market structures with their welfare implications; the pricing of resources.

### **39.256 Macro-economic Theory**

Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Investigation of the conceptual and empirical problems of creating and using national accounts; price index problems; conceptual and empirical evaluation of several consumption and investment functions, and their policy implications; multiplier and accelerator models; a brief history of recent cyclical fluctuations. Theories of inflation and growth are analyzed in the light of recent economic history.

### **39.260 American Economic History**

Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Economic development of U.S. from colonial period to the present; historical changes in available factors, economic institutions and technologies; special attention to preconditions of industrialism; U.S. industrial revolution, its spread and socio-economic consequences; great depression, subsequent rise of mixed economy and welfare state; U.S. adjustments to post-war economic changes.

**39.265 Money and Banking** Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.  
The functioning of the monetary and banking system as a whole, and its relationships with the rest of the economy. Topics will include the functions of money and credit, commercial banking, central banking, monetary theory, international monetary relations, and monetary policy.

**39.266 Government Finance and Fiscal Policy**

Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationships to principles of economic welfare; topics such as principles of taxation; income taxation; consumption basis of taxation; taxation of wealth; the commercial principle; and governmental borrowing and fiscal policy.

**39.271 Social Control of Economic Activities**

Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Historical development of the government's role in economic affairs; the relationships between the government and industry, labor, agriculture, public utilities, consumers; economy in general; anti-trust laws and their effects on market structure and performance; theoretical analysis of interaction of various sectors of the economy.

**39.275 Labor Economics** Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Examination of the economics of the labor market and the labor force and of the institutions and policies dealing with them; employment, unemployment, wage determination, income distribution, and the development and efficient use of labor resources; development of trade unions; collective bargaining issues and their economic consequences.

**39.280 Comparative Economics** Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Competing types of theoretical economic systems; empirical analysis of administration and operations of currently existing types of communist, socialist, and capitalist economies; comparisons in terms of economic functions; evaluation of economic performance in terms of announced goals.

**39.281 Mathematical Economics** Prereq. 39.255 and 39.256; 4 Cl.; 4 Q.H.

Functions and diagrams in Economic Theory: demand, revenue and cost functions; economic applications of derivatives with references to monopoly and duopoly problems; exponential and logarithmic functions with reference to compound interest problems; functions of two variables with reference to production and utility functions; Euler's Theorem and other properties of homogeneous functions.

**39.285 Economic Development** Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Prospects for economic growth in poor nations as indicated by economic analysis and historical experience; social, cultural, and institutional determinants of growth; implications for the international position and policies of the U.S.

**39.286 International Economics** Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Analysis of international economic principles, balance of payments mechanism and international organizations; relevance for international trade problems and policies of recent times.

**39.288 Economic Growth and Business Cycles**

Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Review of macro-economic theory and national product accounts; U.S. economic performance; nature and meaning of U.S. growth; general causes and recent empirical studies; prognosis, and growth policies; meaning and types of business cycles; details of business cycle theories; recent cyclical experience; current situation; brief survey of forecasting techniques; critical examination of current and proposed anti-cyclical programs.

**39.289 Advanced Economic Theory** Prereq. 39.255 and 39. 256; 4 Cl.; 4 Q.H.

Advanced theoretical treatment of selected topics in microeconomics and macroeconomics. Recommended for students planning to take graduate economics.

**39.291 Senior Economics Seminar** Prereq. 39.255 and 39. 256; 4 Cl.; 4 Q.H.

Course for senior economics majors, coordinating and applying economic concepts, methodology, and data to contemporary issues and problems of broad social, economic, and philosophical importance.

**39.292 History of Economic Thought** Prereq. 39.116 or 39.106; 4 Cl.; 4 Q.H.

Comprehensive course of study in the development of economic thought. Coverage includes mercantilism as the first economic doctrine; analysis of older classical school, its later refinements (modern marginalism), and its important critics (socialists, marxists); Keynesian and modern developments.

**39.293 Statistical Methods**

Prereq. 39.251; 4 Cl.; 4 Q.H.

Principles of probability and statistical inference. Topics include estimation and tests of significance, analysis of variance, comparison of Bayesian and classical inference, and combinatorial analysis; application of methods of statistical inference to business and economic research. Computer programming introduced. Offered to qualified seniors.

**39.294 Statistical Methods**

Prereq. 39.293; 4 Cl.; 4 Q.H.

Introduction to principles of management science. Covers matrix algebra; multiple regression models; linear programming models including the simplex and transportation problems; simulation, queuing theory, and statistical decision theory; general development of mathematical models in the solution of business problems; technique of the logarithms; solution of problems with the 1620 computer.

**39.295, 39.296, 39.297, 39.298 Honors Program**

(each) 4 Q.H.

# Accounting Department

**Professors**

Joseph M. Golemme, Chairman,  
 S.B., M.A., C.P.A.  
 Ralph C. Jones, B.S., M.S., Ph.D.,  
 C.P.A.  
 Lawrence H. Malchman, B.S., Ed.M.,  
 C.P.A.  
 Albert Slavin, B.S., M.S., C.P.A.

**Assistant Professors**

Harley H. Anderson, B.S., M.B.A.  
 Richard A. Burnham, B.S., M.B.A.,  
 C.P.A.  
 Joseph R. Curran, B.S., M.B.A.  
 Paul Richards, BS., M.B.A.

**Instructor**

Donald A. DuBois, B.S., M.B.A.

**Associate Professors**

Anker V. Andersen, B.S., M.B.A., Ph.D.  
 Seth A. Armen, B.S., C.P.A.  
 Richard Lindhe, B.S.B.A., B.S.Ed.,  
 M.Ed., Ph.D.  
 Gordon L. Nielsen, B.S., M.B.A., C.P.A.

**41.111 Principles of Accounting**

4 Cl.; 3 Q.H.

The accounting cycle procedure; the analysis of financial transactions; preparation of financial statements; and special journals.

**41.112 Principles of Accounting**

Prereq. 41.111; 4 Cl.; 3 Q.H.

The matching of revenue and expense; the control of cash and receivables; inventory valuation; plant and equipment; control of cash disbursement; corporation accounting.

**41.113 Principles of Accounting**

Prereq. 41.112; 4 Cl.; 3 Q.H.

Managerial financial decisions; corporate financial reporting; consolidated financial statements; source and uses of funds; cash flow; price level changes.

**41.115 Principles of Accounting**

10 Cl.; 9 Q.H.

Covers the content of courses 41.111, 41.112, 41.113. Intended for Transfer Students.

**41.201 Introduction to Accounting — I.E.**

3 Cl.; 3 Q.H.

The accounting cycle; analysis tools defined; statement preparation; control of cash, receivables, inventory, and equipment; introduction to manufacturing accounting.

**41.202 Cost Accounting — I.E.**

Prereq. 41.201; 3 Cl.; 3 Q.H.

Role of cost accounting; cost-volume-profit analysis; cost accumulation procedures; job order, process, standard and direct costing; decision-making; capital budgeting introduction.

**41.205 Cost Accounting**

Prereq. 41.111, 41.112, 41.113; 3 Cl.; 3 Q.H.

Basic cost theory and practice; cost data as management tool, cost volume-profit analysis; introduction to capital budgeting.

**41.207 Analysis of Financial State**

Prereq. 41.111, 41.117, 41.113; 3 Cl.; 3 Q.H.

Preparation of accounting statements; uses of ratios and analytical statements; composition of statements and statement classification; fund and cash flow analysis.

**41.208 Introduction to Accounting — Pharmacy**

4 Cl.; 4 Q.H.

Uses of accounting; recording processes; trading enterprises; alternative recording systems; analytical uses of accounting; payroll accounting; planning and forecasting from accounting data.

**41.209 Distribution Cost Analysis**

Prereq. 41.113; 4 Cl.; 4 Q.H.

Cost accounting with a major emphasis toward applications for marketing purposes; cost accumulation and analysis; uses of costs and cost techniques for control. Pricing will be stressed.

**41.210 Accounting Principles**

Prereq. 39.116; 4 Cl.; 4 Q.H.

For Liberal Arts undergraduates. Accounting as an analytical tool of management; financial statement analysis; corporate financial reporting; investments; financial planning.

**41.212 Controllership**

Prereq. 41.205; 4 Cl.; 4 Q.H.

Place and functions of controller and internal auditor in business enterprises; accounting systems and methods related to such functions as internal control of transactions; fundamentals of establishing and operating a budget.

**41.213 Federal Income Taxes**

Prereq. 41.113; 4 Cl.; 4 Q.H.

A basis survey course of the federal tax structure; an appreciation and understanding of the impact of taxation on business decision. Application of tax principles will be illustrated by specific problems. Estate and trust planning.

**41.214 Accounting Analysis for Decision Making**

Prereq. Cost for Management (or equiv.); 4 Cl.; 4 Q.H.

This course builds upon the students basic knowledge of accounting, providing him with the opportunity to analyze accounting data for use in management decisions. The course stresses use of the information as opposed to its compilation, and relates the work through case problems involving decision making at middle and upper management levels. Areas covered include cost control, capital investment, product mix, transfer pricing and evaluation of division managers.

**41.251 Intermediate Accounting**

Prereq. 41.113; 3 Cl.; 3 Q.H.

The emphasis is on accounting theory and concepts together with an analysis of the special problems that arise in applying these concepts to financial accounting. Areas discussed include the basic accounting process, cash receivables, liabilities, and inventory valuation.

**41.252 Intermediate Accounting**

Prereq. 41.251; 3 Cl.; 3 Q.H.

This is a continuation of the discussion of the traditional structure of accounting theory and is underlying issues together with an evaluation of the

conflicts and shortcomings in accounting concepts. Areas discussed include investment in productive resources and accounting for corporations.

**41.253 Cost Accounting** Prereq. 41.113; 3 Cl.; 3 Q.H.

The accumulation of cost data for managerial analysis and control; process cost accounting and the costing of by-products and joint products.

**41.254 Cost Accounting** Prereq. 41.253; 3 Cl.; 3 Q.H.

Estimated cost systems; budgetary control with standard costs; the cost and profit analyses for decision-making purposes.

**41.255 Advanced Accounting** Prereq. 41.252; 4 Cl.; 4 Q.H.

Varied accounting systems including partnerships, home and branch, parent and subsidiary; foreign exchange.

**41.256 Advanced Accounting** Prereq. 41.255; 4 Cl.; 4 Q.H.

Specialized accounting areas including consignment and instalment sales, receivership, municipal and institutional accounting; estate and trust accounting; taxation and planning.

**41.257 Auditing** Prereq. 41.252; 4 Cl.; 4 Q.H.

Designed to give the Accounting major a thorough knowledge of auditing through the application of auditing principles and adherence to auditing standards; the ethics of the profession together with the impact of new and advanced audit techniques.

**41.258 Accounting Systems and Data Processing** Prereq. 41.252; 4 Cl.; 4 Q.H.

Business information systems and problems; automated data processing systems and applications; digital computer concepts; program languages; the use of flow-charting techniques. These concepts will be applied to assist the student to analyze and improve accounting systems.

**41.259 Seminar** 4 Cl.; 4 Q.H.

The seminar consists of discussion and reports on selected topics in accounting literature.

**41.260 Taxes** 4 Cl.; 4 Q.H.

Basic federal taxation as it applies to individuals, partnerships, and corporations.

**41.261 Role of Accounting in Decision Making** Prereq. 41.256; 4 Cl.; 4 Q.H.

A study of business problems and the role accounting can and should play in their solution.

# Marketing Department

**Professors**

Charles H. Dufton, Chairman,  
A.B., M.A.  
Quentin L. Coons, A.B., M.B.A.

**Associate Professors**

Charles J. Collazzo, Jr., B.A., M.C.S.,  
M.A., Ph.D.  
Robert J. Minichiello, A.B., M.B.A.,  
D.B.A.

**Assistant Professor**

Richard J. Morrison, B.A., M.B.A.

**43.120 Marketing Fundamentals**

3 Cl.; 4 Q.H.

The planning and operating of marketing programs, with emphasis upon effective use of available methods and facilities.

**43.121 Marketing Dynamics**

Prereq. 43.120; 3 Cl.; 3 Q.H.

The dynamics of product innovation and adaptation of marketing strategy to changes in consumer tastes, buying habits, and competitive forces — for both consumer and industrial goods.

**43.220 Marketing Policies and Operations**

4 Cl.; 4 Q.H.

For non-Marketing majors. Management's analytical approach in a variety of firms to product planning, channels of distribution, advertising, personal selling, sales promotion, pricing, and marketing research.

**43.221 Current Issues in Marketing**

4 Cl.; 4 Q.H.

For non-Marketing majors. Reading, discussion, and analysis of current and controversial topics in domestic and international marketing.

**43.230 Marketing Operations I**

Prereq. 43.121; 3 Cl.; 3 Q.H.

Such diverse disciplines as managerial economics, quantitative analysis, and the behavioral sciences are examined as sources of analytical and research tools for effective marketing operations.

**43.231 Marketing Operations II**

Prereq. 43.230; 3 Cl.; 3 Q.H.

A continuation of 43.230, with emphasis upon the application of such analytical and research tools to achievement of effective and efficient marketing operations.

**43.232 Advertising Techniques**

Prereq. 43.121; 3 Cl.; 3 Q.H.

The methods and mechanical processes used to produce advertisements, including television and radio commercials.

**43.233 Retail Management**

Prereq. 43.121; 3 Cl.; 3 Q.H.

From a marketing management point of view, the activities and contributions of major retailing institutions, including department and specialty stores, supermarkets, and discount outlets.

**43.240 Marketing Research I** Prereq. 43.121; 4 Cl.; 4 Q.H.  
The application of theoretical knowledge and research methodology to marketing, with emphasis upon quantitative methods and behavioral science concepts.

**43.241 Marketing Research II** Prereq. 43.240; 4 Cl.; 4 Q.H.  
Operation and interpretation of marketing research studies with applications to problems in advertising product policy, sales, pricing, and motivational research.

**43.242 Sales Management** Prereq. 43.121; 4 Cl.; 4 Q.H.  
Creation, management, and appraisal of the sales force. Case studies and discussions, plus selected readings.

**43.243 Advertising Management** Prereq. 43.121; 4 Cl.; 4 Q.H.  
A study of advertising management through class discussions of case studies selected to illustrate means of achieving proper balance and coordination of advertising with other elements in the marketing mix.

**43.250 Marketing Management I** Prereq. 43.121; 4 Cl.; 4 Q.H.  
The decision-making and managerial aspects of selected marketing programs analyzed through use of case studies that relate to both consumer and industrial goods.

**43.251 Marketing Management II** Prereq. 43.250; 4 Cl.; 4 Q.H.  
A continuation of 43.250, with increased opportunity for student participation in verbal and written analyses of the selected case studies.

**43.260 Industrial Marketing** 4 Cl.; 4 Q.H.  
The marketing of products where business firms are the potential customers. For Marketing and non-Marketing majors.

**43.261 International Marketing** 4 Cl.; 4 Q.H.  
The opportunities, methods, and policies in management of international marketing programs. For Marketing and non-Marketing majors.

**43.270 Marketing Policy Seminar** Prereq. Basic Mktg. Program; 4 Cl.; 4 Q.H.  
One half of the course is concerned with a limited number of case studies in the broad areas of marketing policy and management. The other half combines with the other college departments to give all students the benefit of applying the various functional approaches to specific cases in business administration and policy.

**43.271 Marketing Theory Seminar** Prereq. Basic Mktg. Program; 4 Cl.; 4 Q.H.  
In seminar-type discussions, an attempt is made toward a synthesis and analysis of marketing theory and practice. Course is based upon a list of readings selected from various sources and disciplines.

## Finance and Insurance Department

**Professors**

Edward R. Willett, Chairman,  
B.S., M.A., Ph.D.  
Anghel N. Rugina, B.S., M.A., Ph.D.

**Associate Professors**

Saverio Cerullo, B.S., M.B.A.  
Wesley W. Marple, A.B., M.B.A.,  
D.B.A.

**Assistant Professors**

Roger A. Cossaboom, B.S., M.B.A.  
John F. Fitzgerald, Jr., B.S., M.B.A.,  
C.L.U.  
William A. Lovely, Jr., B.S., M.B.A.  
Robert J. Rosendorn, B.A., M.B.A.  
Edward L. Walls, B.S., M.A., D.B.A.

**Instructor**

Arthur E. Busi, B.A., M.B.A.

**44.120 Introduction to Finance**

4 Cl.; 4 Q.H.

An introduction to the role of finance and insurance in the economic world; a survey of financial institutions and their functions; an analysis of the basic institutions and principles in risk and insurance.

**44.121**

Prereq. 44.120; 4 Cl.; 4 Q.H.

An extension of the institutional information developed in 44.120 to the business firm.

**44.150 Corporate Finance**

Prereq. 44.120; 3 Cl.; 3 Q.H.

An analytical approach to the financial management of the business firm; stress on the importance of cash flow in analysis. The theory of the optimum return on optimum assets is developed under the goal of maximizing the owners' position. Theories of capital budgeting and cost of capital are further developed and applied against considerations of acquisition of both short term and long term assets. Internal sources of funds.

**44.152 Corporate Finance**

Prereq. 44.150; 3 Cl.; 3 Q.H.

A continuation of the analysis of the financing of the firm with emphasis on capital structure and external sources of funds. Various means of financing are discussed both as to inherent advantage and disadvantage and also from the point of view of the effect of these means on the capital structure and cost of capital. Some time is devoted to the process of marketing of securities and the buyers of those securities.

**44.155 Corporate Finance**

Prereq. 44.121; 3 Cl.; 3 Q.H.

A survey of the financial management of the business firm. Various means of financing and sources of funds are discussed. Capital budgeting and cash flow analysis are introduced.

**44.240 Personal Finance**

4 Cl.; 4 Q.H.

The concept of the total personal estate; budgeting, savings, insurance; investments and estate planning.

**44.245 Credit Management** Prereq. 44.150, 44.152; 4 Cl.; 4 Q.H.  
A managerial approach to the matter of extension of credit and collection of receivables within the business firm; emphasis on the measurement of the risk involved, both individual and general; types of credit; evidences of debt; collateral and collateral documents; sources of credit information; evaluation of risk; collection procedures; rights of creditors.

**44.250 Life Insurance** Prereq. 44.120; 3 Cl.; 3 Q.H.  
Modern approaches to personal and business uses, including investment aspects of life insurance; types of contracts are analyzed from both the buyer's and the company's point of view. Legal concepts, the beneficiary clause and settlement options, including analysis of the life insurance contract, are discussed, supplemented by recent court cases. Types and organization of companies: investment policy; underwriting and marketing; risk management; and rate-making principles and techniques, including reserves and surrender values.

**44.252 Property and Casualty Insurance** Prereq. 44.120, 44.250; 4 Cl.; 4 Q.H.  
Initial emphasis on a thorough analysis of the fire insurance, automobile and general liability policies; case discussion; inland marine and selected casualty coverages; underwriting practices and problems; loss prevention and adjustment in property and casualty lines; a brief introduction to rate making; analysis of reserves and reinsurance, the homeowners contract, workmen's compensation, fidelity and surety bonds, and government regulation.

**44.255 Estate Planning** Prereq. 44.250; 3 Cl.; 3 Q.H.  
The nature and process of estate planning, using illustrated cases, is described by evaluating impairments, forming the estate plan, and finally testing the designed plan. Wills, taxation, the marital deduction and life insurance explained in detail; forms of trusts, gifts, and joint ownership as tools available in estate plan.

**44.260 Financial Forecasting** Prereq. 44.151; 4 Cl.; 4 Q.H.  
The relation of forecasting techniques to the long-run goals of the firm. The interrelationship of the future of the company, the industry, and the economy.

**44.270 Investments** Prereq. 44.150, 44.152; 4 Cl.; 4 Q.H.  
Investment goals and objectives; various types of investment compared; the role of the securities market.

**44.272 Security Analysis** Prereq. 44.270; 4 Cl.; 4 Q.H.  
The topic is broadly covered with attention given to the relationship between the economy and stock price averages. Methods of analyzing and appraising developments within the firm; the relation of earnings, dividends, and cash flow to the market valuation of a company's securities; portfolio analysis and planning.

**44.275 Money and Capital Markets** Prereq. 44.272; 4 Cl.; 4 Q.H.  
The fundamentals of the nature, development and functioning of our financial system as crystalized in the money and capital markets; theory and applied theory.

**44.280 Seminar in Finance and Insurance** Prereq. 44.270; 4 Cl.; 4 Q.H.  
 One half of the course concerns case studies in the area of finance and insurance. The other half is integrated with the other college departments to give students the benefit of various approaches to specific cases in business administration.

**44.281 Continuation of Departmental Seminar** Prereq. 44.280; 4 Cl.; 4 Q.H.

## Management Department

### Professors

Lyman A. Keith, Chairman,  
 S.B., M.A., M.B.A.  
 A. Howard Myers, A.B., M.A., Ph.D.

### Associate Professors

Robert W. Mullins, M.B.A.  
 Sidney H. Phillips, A.B., M.Sc., Ph.D.  
 John M. Samaras, A.B., M.B.A., D.B.A.  
 Daniel C. Scioletti, B.B.A., M.Ed.  
 James S. Shulman, B.A., M.B.A., D.B.A.

### Assistant Professors

Joel Corman, A.B., M.B.A.  
 Angelo J. Fiumara, B.A., LL.B.  
 Richard B. Higgins, A.B., M.B.A.  
 Andre P. Priem, B.B.A., M.A.  
 Edward N. Schlar, B.S., M.B.A.  
 Joseph M. Woods, B.A., M.A.  
**Instructor**  
 Steven N. Brenner, A.B., B.Eng.,  
 M.B.A.

**45.120 Introduction to Management and Organization** 3 Cl.; 3 Q.H.  
 American business with emphasis on the fundamental concepts of management and the problems inherent in building and maintaining an effective organization.

**45.121 Introduction to Personnel and Production** Prereq. 45.120; 3 Cl.; 3 Q.H.  
 An introduction to the personnel and production functions of business with emphasis on the fundamental problem areas and the development of techniques that may be employed by management to their solution.

**45.207 Organizational Behavior** Prereq. 45.120; 3 Cl.; 3 Q.H.  
 A study of the behavior of people within the framework of the formal organization structure of business and other institutions.

**45.208 Decision Making** Prereq. 45.120, 45.121; 3 Cl.; 3 Q.H.  
 A study of the concepts and techniques of decision making. Consideration of quantitative analysis and behavioral implications.

**45.209 Decision Making** Prereq. 45.208; 3 Cl.; 3 Q.H.  
 Continuation of 45.208.

**45.255 Personnel Management** Prereq. 45.121; 4 Cl.; 4 Q.H.  
 The problems of management's relations with employees. Topics include: essentials of personnel policy, organizing and manning of work teams, administration of performance standards, and wage and salary administration.

<b>45.256 Industrial Relations</b>	Prereq. 45.255; 4 Cl.; 4 Q.H.
The broader aspects of work relationships. Topics covered include: the social impact of wages, the impact of automation, manpower utilization, and unemployment.	
<b>45.265 Production Management</b>	Prereq. 45.121; 4 Cl.; 4 Q.H.
The management of manufacturing activities. Topics include: product design; methods study; layout, inventory and production control; production standards; control of quality. Statistical techniques are emphasized.	
<b>45.266 Production Management</b>	Prereq. 45.265; 4 Cl.; 4 Q.H.
A continuation of 45.265.	
<b>45.270 Senior Seminar</b>	4 Cl.; 4 Q.H.
In seminar type discussions, one half of the course emphasizes the development of management and organization theory. The other half is integrated with other departments of the college to give students the benefits of various analytical approaches to specific cases in business administration.	
<b>45.271 Seminar in Management</b>	Prereq. 45.270; 4 Cl.; 4 Q.H.
The changing nature of the manager's job. Through cases and readings the student develops a picture of the environment within which tomorrow's managers will operate and the nature of the new tasks involved.	
<b>45.275 Labor Law</b>	Prereq. 45.255, 45.256; 4 Cl.; 4 Q.H.
The changing judicial principles and statutory standards of employment and management-union relations since 1800.	
<b>45.276 Seminar in Collective Bargaining</b>	Prereq. 45.275; 4 Cl.; 4 Q.H.
Cases or reports on problems faced by industrial relations departments dealing with employees through collective bargaining; individual research.	
<b>49.155 Legal Aspects of Business</b>	Prereq. B.A. stud. only; 4 Cl.; 4 Q.H.
The legal aspects of business transactions and business relationships involving contracts, agency, negotiable instruments, suretyship and guaranty.	
<b>49.205 Introduction to Data Processing</b>	Prereq. 45.121; 3 Cl.; 3 Q.H.
Manual, mechanical, and electronic methods of data processing; emphasis on computerized systems, flow charting techniques, and equipment capabilities and limitations.	
<b>49.206 Management Information Systems</b>	3 Cl.; 3 Q.H.
Design, development, and implementation of integrated business systems. The topics of determining management requirements, value and cost of information, and computer feasibility are explored through cases and readings.	
<b>49.210 Legal Aspects of Business Organization</b>	Prereq. 45.155; 4 Cl.; 4 Q.H.
The legal aspects of the typical forms of business ownership; the law of sales transactions in business.	
<b>49.211 Law of Finance and Insurance</b>	Prereq. 45.155; 4 Cl.; 4 Q.H.
Law as it relates to personal property, real property, sales and insurance.	

**49.240 Law in Society**

4 Cl.; 4 Q.H.

This course will acquaint the student, as a member of society, with his legal rights, obligations and responsibilities, applicable in his relationship with others and with the state.

## **Counselor Education** (EDUCATION)

**Professor**

David R. Cook, Chairman, B.S.,  
M.S., Ed.D.

**Assistant Professors**

Thomas F. Harrington, B.A., M.Ed.,  
Ph.D.  
Robert W. Read, A.B., M.A., Ed.D.

This department offers graduate courses only. Consult Graduate Bulletin for course offerings.

## **Foundations Department** (EDUCATION)

**Professors**

E. Lawrence Durham, Chairman,  
A.B., M.A.  
Arnold E. Hanson, Ph.B., Ph.M., Ph.D.

**Assistant Professors**

Ronald E. Baptiste, A.B., M.Ed.  
Lionel P. Etscovitz, A.B., Ed.M.  
Ruth E. Harmon, LL.B., Ed.M.  
Irene A. Nichols, B.S., M.Ed.  
Lucretia P. Richardson, A.B., M.S.

**Associate Professors**

Wendell R. Brown, B.A., LL.B.,  
D.S.S.  
E. Vaughn Gulo, A.B., M.A., Ed.D.  
Helen J. Kenney, A.B., M.Ed., Ed.D.

**50.101 Social Science I**

3 Cl.; 3 Q.H.

Introduction to physical and cultural anthropology; primate evolution and fossil man; development of modern races; behavioral significance of physical differences among individuals and groups; prehistoric archaeology; introduction to ethnography and ethnology.

**50.102 Social Science II**

Prereq. 50.101; 3 Cl.; 3 Q.H.

A comparative approach to the study of social institutions; special attention to kinship, economics, political organization, and religion among non-industrialized peoples representative of major cultural areas of Africa, the Americas, Asia, and the Pacific.

**50.103 Social Science III**

Prereq. 50.102; 3 Cl.; 3 Q.H.

Analysis of social behavior in complex societies; social institutions; social differentiation; collective behavior; social processes and change; contemporary trends and problems.

**50.121 Human Development and Learning I** 4 Cl.; 4 Q.H.  
 Developmental processes from prenatal life up to adolescence; theories of learning and personality, with research and case material covering major aspects of psychological development.

**50.131 Human Development and Learning II** Prereq. 50.121; 4 Cl.; 4 Q.H.  
 Continuation of Human Development and Learning I. Significant aspects of adolescence; physical, social, and psychological factors as they influence adolescent behavior.

**50.141 Measurement and Evaluation**

Prereq. Meth. and Mat. course in maj. field; 4 Cl.; 4 Q.H.

The fundamentals of measurement; basic statistical concepts and techniques used; evaluation of standardized and teacher-made tests.

**50.151 Backgrounds of American Education**

Prereq. 50.141; 4 Cl.; 4 Q.H.

Historical and philosophical foundations of American education beginning with old-world origins; development of American schools and educational thought from the colonial period to the present with emphasis on major current issues in education.

## **Instruction Department** (EDUCATION)

**Associate Professors**

George B. Rochfort, B.S., M.Ed.,  
D.Ed., Acting Chairman

Robert N. Delancey, B.Ed., A.M.,  
Ph.D.

Mary J. Lee, B.A., Ed.M.

Robert C. McLean, Jr., A.B.,  
M.S., Ed.D.

**Assistant Professors**

Robert S. Butters, B.A., M.Ed.

Thomas H. Clark, A.B., M.A.

Harold A. Miner, B.S., Ed.M., Ed.D.

Sandra M. Parker, B.A., Ed.M.

Guy A. Petralia, A.B., A.M., Ed.M.

Philip J. Rushe, A.B., B.S., M.A.

Paul H. Tedesco, A.B., A.M.

**51.124 Modern Mathematics Curricula**

4 Cl.; 4 Q.H.

Mathematics curricula in junior and senior high schools, including experimental programs, presented in their historical setting.

**51.131 Fundamentals of Arithmetic I**

4 Cl.; 4 Q.H.

Techniques of teaching arithmetic so that underlying principles are stressed. Topics are selected to serve as a foundation in mathematics appropriate for any elementary program. Topics considered are: deductive and inductive reasoning, numeration systems, elementary concepts of set theory, whole numbers and rational numbers and their properties, decimal numerals, linear equations and inequalities.

**51.132 Fundamentals of Arithmetic II**

Prereq. 51.131; 4 Cl.; 4 Q.H.

Continuation of Fundamentals of Arithmetic I. Topics considered are: rate, ratio and percent, informal geometry, elementary theorems and proofs, similarity and trigonometry, area of volume, elements of spherical geometry.

**51.135 Analysis of Teaching and Educational Process**

Prereq. 50.131; 4 Cl.; 4 Q.H.

The relationships that exist between instructional objectives and teaching behavior; applications of human development and learning concepts as they relate to subsequent specialized teaching methods and materials. Research results and promising theory are used to extend the prospective teacher's concepts of the teaching function.

**51.140 Methods and Materials for Teaching Modern Languages**

Prereq. 51.135; 4 Cl.; 4 Q.H.

The most effective types of classroom activities, subject unit organization, assignments, examinations, and teaching aids used in modern language; the role of the language laboratory with its problems of selecting equipment, scheduling pupils, planning tapes and content of drill exercises, evaluating results and coordinating its functions with conventional classroom instruction.

**51.141 Elementary Education Compendium I** Prereq. 51.135; 4 Cl.; 4 Q.H.

The curriculum is analyzed on the basis of the overall objectives of the American elementary school. Students evaluate and organize units of work which are appropriate to the level at which they plan to teach. The integrated approach to learning is emphasized, but the integrated approach to science, social studies and language arts subjects is given special attention.

**51.142 Elementary Education Compendium II** Prereq. 51.141; 4 Cl.; 4 Q.H.

The objectives, activities, and methods of evaluation in the elementary school are continued with special attention to the areas of music, art and physical education.

**51.143 Methods and Materials of Teaching English**

Prereq. 51.135; 4 Cl.; 4 Q.H.

An introduction to the structure and functions of language as they apply to the teaching of English; curriculum and planning in English; the unit approach; specific techniques of teaching reading and literature, grammar and usage, written and oral composition, listening, spelling, vocabulary, and the use of mass media.

**51.145 Methods and Materials of Teaching Mathematics**

Prereq. 51.135; 4 Cl.; 4 Q.H.

Theory and practice of teaching secondary mathematics, including a discussion and evaluation of instructional problems. Lesson planning and presentations by individual students will afford appropriate practice and serve as the medium of instruction.

**51.147 Methods and Materials of Teaching the Sciences**

Prereq. 51.135; 4 Cl.; 4 Q.H.

The prospective science teacher is introduced to the following: the philosophies of science and their applicability in society and the secondary school; science curriculum development and application; and pertinent methods and materials in science education.

**51.149 Methods and Materials of Teaching Social Studies**

Prereq. 51.135; 4 Cl.; 4 Q.H.

A consideration of: the philosophical and utilitarian justifications for the teaching of social studies in the public schools; various research tools, indices, and bibliographies available in the social science disciplines; various teaching techniques as they relate to social studies education; current trends in social studies education; the critical evaluation of social issues; the techniques of planning; the relation of significant teaching objectives.

**51.151 Student Teaching and Seminar**

Prereq. 50.141; 8 Q.H.

Opportunity for observation and teaching under regular supervision; carried on daily for full quarter with seminar running concurrently.

## **Reading Department (EDUCATION)**

**Associate Professors**

Melvin E. Howards, Chairman, B.S.,  
M.A., Ph.D.  
Maurice Kaufman, B.S., M.S.

**Assistant Professors**

Nicholas J. Buffone, B.A., M.A., Ph.D.  
Marjorie O. Burrill, B.S., Ed.M.  
Donald S. Leeds, A.B., A.M.  
John F. Maguire, A.B., Ed.M.  
Michael E. Werle, B.S. in Ed., M.Ed.

**Instructor**

Leslie A. Burg, B.S., M.Ed.

**54.126 Teaching Reading in Secondary Schools**

4 Cl.; 4 Q.H.

For English and Social Studies majors in the College of Education who are preparing for teaching in the junior or senior high schools. Basically the same approach and organization applies to this course as to the elementary level course. (one quarter)

**54.135 Fundamentals of Reading I**

4 Cl.; 4 Q.H.

The basic, introductory course in developmental reading for prospective elementary teachers. In the first term the emphasis will be on language and symbolic process as it relates to beginning reading. The word recognition and meanings growth areas will be studied in detail, as will some methods and techniques of testing and grouping. An introduction to some reading books and materials, methods of teaching and the psychology of learning to read. Tutorial work will begin with students.

**54.136 Fundamentals of Reading II**

Prereq. 54.135; 4 Cl.; 4 Q.H.

A continuation and extension of the first term. Study skills; speed and fluency growth areas. The tutorial work will be extended. Greater familiarity with books, materials and methods will be achieved.

**54.141 Remedial Reading**

Prereq. 54.136; 4 Cl.; 4 Q.H.

For prospective teachers in the primary unit. This introductory course familiarizes the student with some of the most commonly known and

met reading problems in the typical classroom as well as in the reading clinic; analysis and evaluation of the typical diagnoses of such problems; corrective programs; tutorial work with a retarded reader, with each student keeping a log or journal of his work with a particular reading problem.

#### **54.142 Linguistics and Reading**

Prereq. 54.136; 4 Cl.; 4 Q.H.

For elementary level teachers (primary unit). The major objective is to translate the knowledge gathered from structural and descriptive linguistics into useful classroom instruction, which includes not only reading instruction, but basic instruction in the related language skills. The contributions, particularly of writers like Fries, Barnhart, Bloomfield and LeFevre, will be analyzed and experimented with in a tutorial situation in order to derive from this approach its practical values for teaching.

#### **54.151 Children's Literature**

Prereq. 54.136; 4 Cl.; 4 Q.H.

For prospective teachers in the primary unit. A comprehensive survey and critical analysis of the books and materials available for basic reading instruction and for supplementary reading activities. After a massive review of the available literature for the children, especially in grades K-3, each student will be responsible for developing some material of his own for trial with subjects. The ultimate goal is to make the student aware of what is available and how to use it most effectively in a reading program.

## **Rehabilitation and Special Education Department (EDUCATION)**

### **Professor**

Reuben J. Margolin, Chairman,  
A.B., M.A., Ed.D.

### **Assistant Professors**

Dorothy M. Aram, B.S., M.A.  
Herbert Sonthoff, M.A., Dn.D., rer. pol.

### **Associate Professors**

Robert J. Ferullo, B.S., Ed.M., Ed.D.  
George J. Goldin, B.S., M.S., Ph.D.  
Helen J. Kenney, A.B., Ed.M., Ed.D.  
Alan B. Sostek, A.B., M.A., Ph.D.

### **Instructors**

Robert Dantona, B.A., B.D., Ed.M.  
Maureen S. O'Donnell, B.S., M.Ed.  
Nancy E. Rosoff, B.S., Ed.M.

#### **55.121 Introduction to Special Education**

4 Cl.; 4 Q.H.

An introductory survey course which emphasizes the characteristics and needs of exceptional children and youth; recognition of exceptional children in the classroom, including: the trainable and educable retarded; emotionally disturbed; social offender; brain-injured; speech-, hearing-, and language-impaired; the physically handicapped; the visually handicapped; and the gifted.

#### **55.122 Introduction to Speech and Hearing Therapy**

4 Cl.; 4 Q.H.

Normal language and speech development in children. Analysis of the most prevalent organic and functional communication disorders, with emphasis on identification techniques. Lectures, demonstrations, and 15 clock hours of observation in University clinic.

**55-124 Anatomy, Physiology, and Neurology of the Speech and Hearing Mechanism** 4 Cl.; 4 Q.H.  
Physiological and mechanical components of speech and hearing. The skeletal, muscular, and nervous systems. Lectures and laboratory demonstrations.

**55.126 Communication Skills for the Teacher** 4 Cl.; 4 Q.H.  
The importance of effective communication in the teaching profession. Utilization of the knowledge of the scientific principles of voice production with practice of effective vocal usage. Integration of communication skills with regular classroom curriculum. Lectures, exercises, demonstration, and observations.

**55.131 Development of Language and Speech** Prereq. 55.122; 4 Cl.; 4 Q.H.  
Analysis of theories related to concept formation, development and utilization of symbols from birth to maturation. Foundations and developmental phases of language and speech. The significance of physiological, neurological, psychological, and intellectual factors affecting language and speech development. Case studies, lectures, demonstration, and observations.

**55.133 Introduction to Linguistics and Phonetics** Prereq. 55.122; 4 Cl.; 4 Q.H.  
Learning and applying the International Phonetic Alphabet. A consideration of articulated phonemes and allophones, sound change, structural and descriptive linguistics applied to problems in communication. The nature of language. Lectures, demonstrations, and observations.

**55.134 Organic Speech Disorders** Prereq. 55.124; 4 Cl.; 4 Q.H.  
Etiology, diagnosis, and prognosis of non-neurological communication disorders; consideration of therapeutic procedures in cleft-palate and cleft-lip, and related maxillo-facial abnormalities; laryngectomy; and tongue-thrusting. Lectures, observations, and demonstrations.

**55.141 Methods and Materials in Speech and Hearing** Prereq. 55.135; 4 Cl.; 4 Q.H.  
Various materials and methods used in the correction of speech problems. The rationale of the corrective process; selection, preparation, and presentation of materials. Speech correction and improvement through an integrated approach.

**55.142 Introduction to Audiology** Prereq. 55.124; 4 Cl.; 4 Q.H.  
The physics of sound, anatomy, physiology, and neurology of the ear. Basic techniques in audiometric testing. Lectures, demonstrations, and observations.

**55.143 Diagnostic Techniques in Speech and Hearing** Prereq. 55.134; 4 Cl.; 4 Q.H.  
Diagnosis and therapy in communication disorders in children and adults; tests utilized in evaluation of individuals with language, speech, and hearing disorders. Demonstrations, case histories, and experience in University clinic.

**55.144 Clinical Practice in Speech and Hearing I**

Prereq. 55.131, 55.133; 2 Cl.; 6 (clinic) Lab.; 4 Q.H.

Practicum in language, speech, and hearing diagnosis and therapy in University clinic. Students should reserve a block of hours for clinic practicum. A minimum of 100 clock hours.

**55.145 Functional Speech Disorders**

Prereq. 55.124; 4 Cl.; 4 Q.H.

Etiology, diagnosis, and prognosis of communication disorders of non-organic origins. Language and speech disorders and the psychodynamics of personality development. Lectures and demonstrations, case histories, and experience in the University clinic.

**55.152 Speechreading and Auditory Training**

Various speechreading methods; an integrated approach to the treatment of hard-of-hearing individuals; auditory training techniques and materials.

**55.154 Introduction to Stuttering**

Prereq. 55.145; 4 Cl.; 4 Q.H.

A consideration of some of the major theories of stuttering. Diagnosis and therapy procedures. Lectures, demonstrations, and observations.

**55.155 Clinical Practice in Speech and Hearing II**

Prereq. 55.144 and 100 in University clinic. 2 Cl.; 6 (clinic) Lab.; 4 Q.H. Practicum in language, speech, and hearing diagnosis in a medical and/or rehabilitation center; a multidisciplinary approach in the treatment of children and adults.

## **Health Education, Physical Education, Physical Therapy, and Recreation Education Departments**

**Professors**

Katharine Carlisle, Chairman,  
Physical Therapy, A.B., P.T. Cert.

John W. Fox, Chairman,  
Physical Education (Men), A.B.,  
M.A., Ed.D.

Kathryn Luttgens, Chairman,  
Physical Education (Women),  
B.S., M.S., Ph.D.

Alfred H. McKay, Chairman, Recreation, B.A., M.A., Ed.D.

Kathryn J. Shaffer, Associate Chairman, Physical Therapy, B.S., M.S.

**Associate Professors**

Carl S. Christensen, B.S., M.S.  
Jeanne L. Rowlands, B.S., B.A.,  
M.A.

Elizabeth W. Van Slyck, B.S., M.S.  
Harold A. Walker, B.A.

Richard C. Zobel, B.S., M.A., Ed.D.

**Assistant Professors**

Florence D. Frades, B.S.  
Royal Goheen, B.S., Ed.M.  
Kerkor Kassabian, B.S., Ed.M.  
Charles E. Larson, B.S., M.S.  
Maura M. Morton, B.A., M.S.  
Frank M. Robinson, B.A., M.Ed.

**Instructors**

Pauline A. Cerasoli, B.S.  
Maurine Clancy, B.S.  
Robert S. Curtin, B.S., Ed.M.  
William J. Gillespie, B.S.  
Jocelyn Leathem, B.S.  
Mary E. Watkins, B.S.

## PHYSICAL EDUCATION REQUIRED COURSES — WOMEN

**60.101 Physical Education Activity** 2 Lab.; 1 Q.H.  
 Students must complete two terms of physical education activities selected from the areas of team, individual, or dual sports, gymnastics, dance, aquatics, basic motor skills. Selection will be made in terms of student's interest and ability. Required for all university women *not* majoring in Physical Education.

**60.102 Physical Education Activity** 2 Lab.; 1 Q.H.  
 Same as above.

## PROFESSIONAL COURSES — WOMEN

**60.121 Physical Education Skills I** 1 Cl.; 3 Lab.; 2 Q.H.  
 Development of knowledges and skills necessary for competent performance in areas of hockey, soccer-speedball and volleyball.

**60.122 Physical Education Skills II** 2 Cl.; 4 Lab.; 3 Q.H.  
 Development of knowledges and skills necessary for competent performance in areas of basketball, rhythmic analysis, and fundamental motor skills.

**60.123 Physical Education Skills III** 2 Cl.; 4 Lab.; 3 Q.H.  
 Development of knowledges and skills necessary for competent performance in areas of modern dance, swimming and diving, and lacrosse.

**60.125 Camp Leadership and Outdoor Education I** 4 Q.H.  
 A three-week resident session at the Warren Center. Emphasizes knowledge and personal skill development in several phases of camping, conservation, and outdoor education, including introduction to counselor education.

**60.131 Physical Education Skills IV** 2 Cl.; 4 Lab.; 3 Q.H.  
 Development of knowledges and skills necessary for competent performance in areas of gymnastics, folk, square and social dance, and life saving skills

**60.132 Physical Education Skills V** 2 Cl.; 4 Lab.; 3 Q.H.  
 Development of knowledges and skills necessary for competent performance in areas of racquet sports, and track and field.

**60.135 Camp Leadership and Outdoor Education II** 4 Q.H.  
 A three-week resident session at the Warren Center. Development of teaching proficiency in several phases of camping and outdoor education. Continued study of camp leadership, counselor education, conservation, and school camping.

**60.140 Analysis and Teaching of Physical Activities I**  
 Prereq. 60.122, 60.123, 60.131; 2 Cl.; 4 Lab.; 3 Q.H.  
 Analysis of performance and methods of teaching in the areas of dance and aquatics.

**60.141 Analysis and Teaching of Physical Activities II**

Prereq. 60.121, 60.122, 60.131; 2 Cl.; 4 Lab.; 3 Q.H.

Analysis of performance and methods of teaching in the areas of team sports (indoor) and gymnastics.

**60.142 Analysis and Teaching of Physical Activity III**

Prereq. 60.121, 60.123, 60.132; 2 Cl.; 4 Lab.; 3 Q.H.

Analysis of performance and methods of teaching in the areas of field sports and racquet sports.

**60.143 Winter Sports**

1 Q.H.

Five-day resident session at North Conway, N.H. Participation according to ability in classes of Hannes Schneider Ski School. Evening seminars in skiing theory and teaching methods.

**60.150 Human Anatomy I**

2 Cl.; 3 Lab.; 3 Q.H.

Gross anatomy of the bones, joints and muscles of the human body; emphasis on practical application in relation to student's work in physical education.

**60.151 Human Anatomy II**

3 Cl.; 3 Q.H.

The gross anatomy of the human body exclusive of the bone, joint, and muscle systems.

**60.160 Instructional Technology**

2 Cl.; 2 Q.H.

Survey of selection, evaluation, preparation, and production of audio-visual media, instructional television, and programmed learning. Some opportunity to work with related equipment.

**60.220 Program and Methods in Elementary School Physical Education**

Activities Prereq. 19.102, 50.121, 50.131; 4 Cl.; 4 Q.H.

Philosophy, program planning, and methods for teaching children; guided observation experiences with children in schools; individual teaching presentations and evaluations in basic motor skills, dance activities, games, gymnastics, and sports.

**60.230 Advanced Teaching and Analysis**

Prereq. 2 Cl.; 4 Lab.; 3 Q.H.

Advanced study of teaching methods and analysis in one of areas studied in Physical Education 60.140-142 and one individual sport.

**60.261 Curriculum Building and Trends**

3 Cl.; 3 Q.H.

Basic foundations of curriculum development, stressing fundamental principles and guides to curriculum organization and improvement in continuous process; emphasis on transmission of knowledge, learning, and values in the natural and cultural environment.

**60.280 Supervised Teaching**

Prereq. P.E. Curr. in sequence; 12 Q.H.

Observation and teaching at the elementary and secondary school levels; development of understandings of school and community; conduct of classes and extraclass activities. Emphasis on continuity of units, lessons, and

daily evaluations; supervision by cooperating school and Boston-Bouvé College faculty; individual conferences and group seminars.

**60.290 Special Problems** Prereq. by permission; 3 Q.H.  
Individual research or independent study related to some phase of physical education. Open only to students selected by department faculty on basis of proven ability.

### REQUIRED COURSES — MEN

**61.100 Basic Physical Education** 2 Lab.; 1 Q.H.  
The role of physical activity in daily living as based on the physiological, psychological and sociological needs of man; instruction and participation of an individualized nature.

**61.110 Beginning Swimming** 2 Lab.; 1 Q.H.  
Instruction in the elementary techniques of swimming; emphasis on fundamental skills and safety procedures.

**61.111 Intermediate Swimming** Prereq. 61.110 or permission; 2 Lab.; 1 Q.H.  
Instruction in the basic swimming strokes; emphasis on form, techniques, endurance.

**61.113 Senior Life Saving** Prereq. 61.112 or permission; 3 Lab.; 1 Q.H.  
Development of advanced skill in life saving theory and techniques; Red Cross senior life saving certification possible.

**61.125 Introduction to Gymnastics** 2 Lab.; 1 Q.H.  
Instruction in the elementary techniques of tumbling, free exercise, apparatus, and trampoline.

**61.126 Tumbling** Prereq. 61.125 or permission; 2 Lab.; 1 Q.H.  
intermediate and advance instruction in tumbling and free exercise.

**61.127 Apparatus** Prereq. 61.125 or permission; 2 Lab.; 1 Q.H.  
Intermediate and advanced instruction on apparatus and trampoline.

**61.133 Badminton** 2 Lab.; 1 Q.H.  
Instruction in badminton at the elementary and intermediate levels.

**61.141 Track and Field** 2 Lab.; 1 Q.H.  
Instruction in track, field, and cross country at the elementary and intermediate levels.

**61.143 Weight Training** 2 Lab.; 1 Q.H.  
Introduction to the principles and use of resistive exercises; isotomic exercise (weights), isometric, and the appropriateness of each.

**61.147 Bowling** 2 Lab.; 1 Q.H.  
Beginning and intermediate instruction in bowling. Scoring, calculating handicaps, etiquette, terminology, selecting equipment, rules.

<b>61.165 Ballroom Dancing</b>	2 Lab.; 1 Q.H.
Instruction in the foxtrot, waltz, and polka; emphasis on elementary technique and procedure.	
<b>61.175 Basketball</b>	2 Lab.; 1 Q.H.
Instruction in basketball at the intermediate level; emphasis on offensive and defensive individual and team play.	
<b>61.176 Flag Football</b>	2 Lab.; 1 Q.H.
Instruction in flag football at the elementary and intermediate levels; emphasis on offensive and defensive individual and team play.	
<b>61.177 Soccer</b>	2 Lab.; 1 Q.H.
Instruction in soccer at the elementary and intermediate levels; emphasis on offensive and defensive individual and team play.	
<b>61.178 Softball</b>	2 Lab.; 1 Q.H.
Instruction in softball at the intermediate level; emphasis on offensive and defensive skills, rules, modification, value as a recreational activity.	
<b>61.179 Volleyball</b>	2 Lab.; 1 Q.H.
Instruction in volleyball at the elementary and intermediate levels; emphasis on its value as a recreational activity; individual and team play, variations of play, scoring.	
<b>61.185 Personal Defense</b>	2 Lab.; 1 Q.H.
Instruction in techniques of self-defense against armed or unarmed assailant; legal involvement.	
<b>61.186 Boxing</b>	2 Lab.; 1 Q.H.
Instruction in boxing at the elementary and intermediate levels; emphasis on offensive and defensive techniques, training, scoring, officiating.	
<b>61.187 Wrestling</b>	2 Lab.; 1 Q.H.
Instructions in wrestling at the elementary and intermediate levels; emphasis on offensive and defensive techniques, scoring, training, officiating.	

**PROFESSIONAL COURSES — MEN**

<b>61.200 Aquatics I</b>	Prereq. 61.100 or permission; 1 Cl.; 3 Lab.; 2 Q.H.
Instruction in beginning, intermediate, and advanced swimming skills with emphasis on the development of teaching methods and techniques.	
<b>61.201 Aquatics II</b>	Prereq. 61.200 or permission; 1 Cl.; 3 Lab.; 2 Q.H.
The theory and techniques of coaching swimming, diving, and competitive skills. Special emphasis on officiating and meet organization.	
<b>61.205 Gymnastics I</b>	Prereq. 61.125 or permission; 1 Cl.; 2 Lab.; 2 Q.H.
Intermediate and advanced skills in stunts and tumbling, apparatus, and free exercise; special emphasis on instructional techniques, safety, and the conducting of exhibitions and meets.	

**61.210 Elementary School Activities** 3 Lab.; 1 Q.H.  
Activities appropriate to the elementary school level; special emphasis on movement, games of low organization, dance, self-testing activities.

**61.212 Handball and Squash** 3 Lab.; 1 Q.H.  
The skills and techniques involved in the teaching of handball and squash; special emphasis on skills involved, rules, courtesies and strategies in each sport.

**61.220 Survey of Recreational Sports** 3 Lab.; 1 Q.H.  
Introduction to such recreational activities as archery, deck tennis, table tennis, horseshoes; emphasis on rules, teaching techniques, place in the program.

**61.221 Volleyball and Badminton** 3 Lab.; 1 Q.H.  
The theory and teaching of volleyball and badminton; special emphasis on rules, court and game courtesies, and strategies.

**61.230 Secondary School Dance** 3 Lab.; 1 Q.H.  
The techniques of dance instruction at the junior and senior high school levels.

**61.235 Team Sports I** 1 Cl.; 2 Lab.; 2 Q.H.  
The coaching of basketball and baseball to beginners; emphasis on role of head coach and assistant coach; organizing practice; the basic fundamentals of individual and team play.

**61.236 Team Sports II** 1 Cl.; 2 Lab.; 2 Q.H.  
The coaching of football and track to beginners; role of head coach and assistant coach; organizing practice; the basic fundamentals of individual and team play.

**61.237 Team Sports III** 3 Lab.; 1 Q.H.  
Techniques of teaching soccer, speedball and softball; special emphasis placed on rules, courtesies and strategies.

**61.240 Introduction to Combatives** 3 Lab.; 1 Q.H.  
The basic fundamentals, techniques, rules, and strategy in such combative activities as boxing, wrestling, judo and combative games.

**61.241 Advanced Wrestling** Prereq. 61.240 or permission; 1 Cl.; 2 Lab.; 2 Q.H.  
Advanced techniques in coaching wrestling at the senior high school and college levels; emphasis on fundamentals of a more advanced nature: care of athletes, officiating, conduct of meets.

**61.242 Advanced Boxing** Prereq. 61.240 or permission; 1 Cl.; 2 Lab.; 2 Q.H.  
Advanced techniques in coaching boxing; emphasis on offensive and defensive techniques, rules, and officiating.

**61.245 Survey of Winter Sports** 1 Cl.; 4 Lab.; 3 Q.H.  
Introduction to such activities as skiing, tobogganing, skating; emphasis on skills; teaching techniques, safety procedures.

**61.250 Anatomy and Physiology** 3 Cl.; 2 Lab.; 4 Q.H.  
Gross anatomy and physiology of the human skeletal and muscular systems.

**61.251 Anatomy and Physiology** Prereq. 61.250 or permission; 3 Cl.; 2 Lab.; 4 Q.H.  
Gross anatomy and physiology of the human nervous and circulatory systems.

**61.252 Anatomy and Physiology** Prereq. 61.251 or permission; 3 Cl.; 2 Lab.; 4 Q.H.  
Gross anatomy and physiology of the human respiratory, digestive, and urinary systems.

**61.263 Methods and Materials in Physical Education** Prereq. 62.210 or permission; 4 Cl.; 4 Q.H.  
Methods and materials to be used in curriculum development, class management and teaching; preparation for student teaching.

**61.265 Advanced Football** Prereq. 61.236 or permission; 2 Cl.; 2 Lab.; 3 Q.H.  
Basic techniques in coaching football at the senior high school and college levels; emphasis on individual and team play; offensive and defensive systems; role of head and assistant coaches; scouting; use of teaching aids; team management.

**61.266 Advanced Basketball** Prereq. 61.235 or permission; 2 Cl.; 2 Lab.; 3 Q.H.  
Basic techniques at the senior high school and college levels; emphasis on systems of offensive and defensive team play; scouting; use of teaching aids; team management.

**61.267 Advanced Baseball** Prereq. 61.235 or permission; 2 Cl.; 2 Lab.; 3 Q.H.  
Basic techniques in coaching baseball at the senior high school and college levels; emphasis on individual and team play; role of head and assistant coaches; team management.

**61.268 Advanced Track** Prereq. 61.236 or permission; 2 Cl.; 2 Lab.; 3 Q.H.  
Basic techniques of coaching track and field at the senior high school and college levels; emphasis on care and training of athletes; practice schedules; coaching techniques; conduct of meets.

**61.280 Camp Leadership** 1 Cl.; 3 Lab.; 2 Q. H.  
Introduction to the procedures of organized camping and outdoor activities; emphasis placed on camp skills; equipment; counseling; trip leadership; laboratory experiences.

**61.285 First Aid** 1 Cl.; 2 Lab.; 2 Q.H.  
First aid procedures recommended for the home, school and community; emphasis on practices endorsed by the American Red Cross.

**61.287 Athletic Training** Prereq. 61.285 or permission; 2 Cl.; 2 Lab.; 3 Q.H.  
The training procedures in athletic programs; special emphasis on the prevention of athletic injuries; role of the trainer, athletic coach, and health services.

**61.290 Student Teaching** 12 Q.H.

**PROFESSIONAL COURSES — MEN AND WOMEN**

**62.200 Professional Orientation to Physical Education** 1 Cl.; 1 Q.H.  
 Introduction to the history, objectives, literature, and organizations of the profession of physical education; discussion of responsibilities and opportunities of professional personnel.

**62.210 History and Principles of Physical Education** Prereq. 62.200; 4 Cl.; 4 Q.H.  
 Preview of history of physical education; the place and function of physical education in education and society; identification of principles for development of sound programs.

**62.253 Kinesiology** Prereq. 60.150, 60.151 and physiology; 4 Cl.; 4 Q.H.  
 Science of human motion; anatomic, mechanical, and physiological principles as they relate to an understanding of skillful, efficient and purposeful human motion.

**62.254 Physiology of Exercise** Prereq. 62.253; 3 Cl.; 2 Lab.; 4 Q.H.  
 Study of the immediate and long-range effects of exercise upon the human body. Emphasis on the circulatory and respiratory systems, training, the scientific foundations of physical fitness; survey of related research.

**62.255 Adapted Physical Education** Prereq. 62.254; 3 Cl.; 2 Lab.; 4 Q.H.  
 Examination techniques for recognition of atypical conditions; characteristics and problems of the atypical; selection and adaptation of physical activities to meet individual needs.

**62.260 Measurement and Evaluation** Prereq. 62.210; 4 Cl.; 4 Q.H.  
 Construction, use, selection, and interpretation of evaluative tools applicable to physical education; elementary statistical methods.

**62.270 Administration of Physical Education** Prereq. 62.210; 4 Cl.; 4 Q.H.  
 The organization and administration of programs in physical education with emphasis on the elementary and secondary school program.

**RECREATION EDUCATION**

**63.120 Professional Orientation to Recreation** 1 Cl.; 1 Q.H.  
 Philosophy and scope of modern recreation and its role in society. Discussion of opportunities at home and abroad in school and community settings, in agencies, hospitals, institutions, and industries. Focus on goals for American recreation.

**63.121 Recreation Skills I** 6 Lab.; 2 Q.H.  
 Techniques of leadership, participation, planning for recreation in social settings for all ages—parties, programs, special events. Repertoire—mixers, dances, games, songs, skits. Creativity stressed. Includes recreational activities for children and youth.

**63.122 Recreation Skills II**

1 Cl.; 6 Lab.; 3 Q.H.

Selected sports, dance, aquatics, and gymnastics. For participation and teaching fundamentals in physical recreation. Course includes rhythmic analysis and musical accompaniment on such instruments as the ukelele, autoharp, and piano.

**63.123 Recreation Skills III**

1 Cl.; 6 Lab.; 3 Q.H.

Selected sports, dance, aquatics, and gymnastics for participation and teaching fundamentals in physical recreation. Course includes arts and crafts for use in school and community.

**63.125 Outdoor Education and Camp Leadership**

4 Q.H.

Three-week resident summer session at the Warren Center, including natural science, aquatics, overnights and tripping, Indian lore, camp counselor education, and camp leadership.

**63.126, 63.127, 63.128, 63.129 Outdoor Education**

(each) 1 Q.H.

A supplement to 63.125 (and taken on a year-round basis in the second and third college years), with opportunities for enrichment in the out-of-doors. Skills; i.e., cookery, camp fire programs, camp craft, leisure activities.

**63.131 Techniques of Recreation Leadership**

1 Cl.; 6 Lab.; 3 Q.H.

Study and practical experience in a diversity of group programs and processes; i.e., workshops, committees, clubs, informal gatherings, recreational programs for school, camp, and community; field trips.

**63.132 Interagency Planning for Community Action**

3 Cl.; 3 Q.H.

A study of agencies and how they function (program and personnel); how agencies cooperate for interagency programming. Legal and financial aspects and their effect on program.

**63.133 Recreation Skills IV**

6 Lab.; 2 Q.H.

Participation, analysis, and teaching in selected recreation activities.

**63.134 Recreation Skills V**

6 Lab.; 2 Q.H.

Participation, analysis, and teaching in selected recreation activities.

**64.143 Winter Sports**

1 Q.H.

Five-day resident session at North Conway, N. H. Participation according to ability in classes of Hannes Schneider Ski School. Evening seminars in skiing theory and teaching methods.

**63.135 Social Recreation**

2 Cl.; 2 Q.H.

Techniques of leadership, participation, planning for recreation in social settings for all ages — parties, programs, and special events. Repertoire — mixers, dances, games, songs, and skits. Creativity stressed. For non-Recreation majors.

**63.150 Human Anatomy I — Functional**

3 Cl.; 3 Q.H.

Gross anatomy of the bones, joints, and muscles of the human body; emphasis on practical application in relation to student's work in physical recreation.

**63.151 Human Anatomy II — Functional** 3 Cl.; 3 Q.H.  
Gross anatomy of the human body exclusive of the bone, joint, and muscle systems; emphasis on practical application in relation to student's work in physical recreation.

**63.160 Development and Utilization of Recreation Education Resources** 3 Cl.; 3 Q.H.  
Survey of field and audio-visual education and resources; instruction and practice in use of equipment and materials; collection and processing of Recreation Development Center resources.

**63.210 Philosophy of Recreation and Leisure** Prereq. 63.120; 3 Cl.; 3 Q.H.  
*Goals for American Recreation* studied in modern context; implications for the profession; historical background; concepts of work, leisure, recreation; trends, issues and future directions.

**63.215 Trends and Issues in Recreation** 3 Cl.; 3 Q.H.  
For non-majors in Recreation. National and international issues and trends in the professional field; trends in participation with professional implications; emerging programs; legislation; the leader and the future.

**63.220 Methods and Materials in Recreation** 3 Cl.; 3 Q.H.  
Philosophy, program planning, motivational techniques, methods of teaching and organizing materials and groups, utilization of equipment.

**63.230 Course eliminated**

**63.240 Dance and the Cultures** 2 Cl.; 3 Lab.; 3 Q.H.  
Folk dance and the related arts; emphasis on cultural understanding and appreciation through dance, music, arts, crafts, customs, foods, dress, history and tradition.

**63.250 Group Dynamics** 3 Cl.; 3 Q.H.  
The group process; how groups arrive at group identity; factors influencing size, purpose, behavior patterns, selection of individual members; training and experience in leadership techniques.

**63.255 Adapted Recreation for Special Groups** 3 Cl.; 3 Q.H.  
Concentrated study and individual projects in area of special interest: mentally retarded, handicapped, aging, culturally deprived, socially atypical, others.

**63.260 Organization and Administration of Recreation and Parks** 4 Cl.; 4 Q.H.  
Financial support and management; promotion; budgeting; personnel policies; arrangements and facilities; underlying principles and contemporary patterns.

**63.265 Techniques of Supervision and Evaluation**  
Prereq. Basic Progr. Math. and 63.250; 3 Cl.; 3 Q.H.  
Current methods and materials; observation of recreation programs, supervision and evaluation; in-service education; appraisal, measurement, evaluation.

**63.270 Arts and Crafts**

1 Cl.; 6 Lab.; 3 Q.H.

Opportunities to learn and to teach in various media—clay, paper, crayon, paint, print, leather, wood, metal, yarn, natural and scrap materials; emphasis on creativity, skill and enjoyment for all ages.

**63.280 Supervised Field Experiences and Teaching**

Prereq. Basic Recreation Curr. in seq.; 12 Q.H.

Equivalent to student teaching in education. Professional assignment in recreation settings; i.e., industry, center, school, hospital, agency, organization, housing, settlement, park, playground, camp. Supervision and conferences. Seminar.

**63.285 Research and Readings in Recreation**

4 Cl.; 4 Q.H.

Survey of research; elementary techniques of research; review of current literature in the field.

**63.290 Senior Seminar and Projects**

4 Cl.; 4 Q.H.

Independent study; development of individual projects; scheduled seminars; selected guests.

**PHYSICAL THERAPY****64.111 Introduction to Physical Therapy**

½ Cl.; 1½ Lab.; 1 Q.H.

A general orientation to the field of physical therapy, its role in the health professions, basic nursing procedures, and the variety of professional opportunities offered.

**64.112 Introduction to Physical Therapy**

Prereq. 64.111; ½ Cl.; 1½ Lab.; 1 Q.H.

Theory and practice in body mechanics, postural examinations, and patient management.

**64.121 Gross Anatomy**

Prereq. general biology; 3 Cl.; 6 Lab.; 5 Q.H.

The structure and functions of the human body with particular emphasis on the skeletal, muscular and nervous systems. Lecture and laboratory with dissection.

**64.131 Applied Anatomy**

Prereq. 64.121, physics; 2 Cl.; 3 Lab.; 3 Q.H.

A further study of neuromuscular function with emphasis on the mechanical and physiological factors involved; application to normal and pathological movement.

**64.140 Physical Therapy Procedures**

Prereq. 64.121; 3 Cl.; 6 Lab.; 5 Q.H.

Theory; demonstration, and practice in basic therapeutic exercise, functional activities, goniometry and massage.

**64.150 Physical Therapy Procedures**

Prereq. 64.140, 64.131; 3 Cl.; 6 Lab.; 5 Q.H.

Theory, demonstration and practice in advanced therapeutic exercise; manual muscle testing; heat, light and hydrotherapy; theory and demonstration of prosthetic devices.

**64.160 Physical Therapy Procedures**

Prereq. 64.140, 64.150; 1 Cl.; 6 Lab.; 3 Q.H.

Theory, demonstration and practice in electrical muscle stimulation and special procedures in the treatment of neurological problems.

**64.165 Professional Literature and Rehabilitation**

Prereq. all Physical Therapy courses; 2 Cl.; 2 Q.H.

Professional literature through Journal Club; the total field of rehabilitation emphasizing knowledge of community resources for the disabled.

**64.170 Physical Therapy Procedures**

Prereq. 64.140, 64.150, 64.160; 2 Cl.; 9 Lab.; 5 Q.H.

Theory, demonstration, and practice in advanced treatment and testing procedures.

**64.175 Ethics and Administration**

Prereq. all Physical Therapy courses; 2 Cl.; 2 Q.H.

History of the profession; principles and methods of administration of a physical therapy department; emphasis on development of desirable personal and professional attitudes and relationships.

**64.185 Supervised Clinical Practices**

Prereq. all Physical Therapy courses; 17½ Lab.; 4 Q.H.

Supervised clinical experience in various physical therapy departments in the Boston area.

**64.190 Clinical Seminar**

Prereq. concurrent with 64.185; 1 Cl.; 1 Q.H.

Selected topics related to clinical practice and presentation of case reports.

**64.195 Supervised Clinical Practice**

Prereq. 64.185; 40 Lab.; 8 Q.H.

A continuation of supervised clinical experience on a full-time basis; assignments in Massachusetts and other states.

**64.210 Pathology**

Prereq. 64.121; 3 Cl.; 3 Q.H.

Lectures and demonstrations of pathological gross specimens: inflammation; repair; infection; immunity and hypersensitivity; degenerative processes; disturbances of metabolism and circulation; disorders of growth, including tumors.

**64.220 Clinical Medicine**

Prereq. 64.121; 3 Cl.; 3 Q.H.

Lectures covering the various areas of medicine and surgery related to conditions commonly encountered in patients treated by the physical therapist: pediatrics, general medicine, general surgery.

**64.221 Clinical Medicine**

Prereq. 64.220; 2 Cl.; 2 Q.H.

A continuation of Clinical Medicine 64.220. Orthopedic conditions; thoracic surgery; Role of the Laboratory.

**64.222 Clinical Medicine**

Prereq. 64.220, 64.221; 3 Cl.; 3 Q.H.

A continuation of Clinical Medicine 64.220. Clinical Neurology and Neurosurgery; plastic surgery; dermatology; gynecology; urology.

**64.223 Clinical Medicine** Prereq. 64.220, 64.221, 64.222; 2 Cl.; 2 Q.H.

A continuation of 64.220. Role of the laboratory; dermatology; gynecology; plastic surgery; burns; urology.

**64.235 Psychiatry** Prereq. 19.105, 50.121; 3 Cl.; 3 Q.H.

Modern psychiatric methods of diagnosis and treatment with special emphasis on those conditions with which the physical therapist is concerned.

**64.240 Electrotherapy** Prereq. 11.136, 11.137; 3 Cl.; 3 Q.H.

Basic electrophysics, physical and physiological effects of therapeutic electric currents; clinical uses and applications for radiation low- and high-frequency currents.

**64.245 Applied Physiology**

Prereq. Phys. 1 and 2, all Phys. Ther. courses; 2 Cl.; 3 Lab.; 3 Q.H.

Effects on the physiological processes of the body produced by basic treatment and testing procedures of physical therapy; modifications due to pathological changes.

**64.250 Neuroanatomy** Prereq. 64.121, 64.131; 3 Cl.; 3 Q.H.

Morphological and functional arrangement of the nervous system; derangement of normal structure and function of the nervous system in various diseases.

## **HEALTH EDUCATION**

**65.129 Health Education** 3 Cl.; 3 Q.H.

Principles of personal health; emphasis upon information pertinent to mental and physical well-being, current social behavior, and effective approaches to college living.

**65.210 Personal Health** 3 Cl.; 3 Q.H.

Principles of healthful living; their application to interpersonal relations and physical education.

**65.215 School and Community Health** Prereq. 65.129; 3 Cl.; 3 Q.H.

Focusing the teacher's important role in developing and relating the principles, patterns and programs of school and community health education.

**65.216 Methods and Materials in Health Education**

Prereq. 65.215; 4 Cl.; 4 Q.H.

Materials appropriate to the teaching of health and safety in the elementary and secondary school; emphasis on direct unit instruction.

**65.218 Public Health** 3 Cl.; 3 Q.H.

Principles of public health with particular emphasis on the emerging patterns of community organizations and activities in the public health field.

# PHARMACY

**Professor and Dean**

LeRoy C. Keagle, B.S. in Pharm.,  
Ph.D.

**Professors**

Bernard J. Brent, Director, Graduate  
School of Pharmaceutical Sciences;  
Chairman, Medicinal Chemistry,  
B.S., M.S., Ph.D.

Russell E. Brillhart, A.B., B.S. in  
Pharm., M.Sc., D.Sc.

O. James Inashima, B.S. in Pharm.,  
M.S., Ph.D.

George M. Krause, B.S. in Pharm.,  
M.S.

John F. Reinhard, Chairman,  
Pharmacology, B.S., M.S., Ph.D.

John W. Schermerhorn, B.S. in  
Pharm., Ph.D.

Pierre F. Smith, Chairman, Pharmacy  
and Pharmacy Administration,  
B.S. in Pharm., Ph.D.

Elliot Spector, B.S. in Pharm., Ph.D.

**Associate Professor**

Albert H. Soloway, B.S., Ph.D.

**Assistant Professors**

Arnold S. Goldstein, B.S. in Pharm.,  
LL.B., M.S.B.A.

Frank R. Gonet, B.S. in Pharm., M.S.  
Frederick J. Pruym, B.S., M.S., Ph.D.

**Instructors**

Alfred W. Eicholzer, B.S., M.S.  
Joseph L. Labrecque, B.S. in Pharm.,  
M.B.A.  
Walter G. Osiecki, B.S. in Pharm.,  
M.S.

## PHARMACY AND PHARMACY ADMINISTRATION

**71.201 Pharmacy Orientation**

1 Cl.

The curriculum, the organizations in pharmacy and their objectives, the ethical standards of the profession, the opportunities in its various branches, and the responsibilities of the pharmacist as a member of the health team.

**71.202 Pharmacy Orientation**

Prereq. 71.201; 1 Cl.

Continuation of 71.201.

**71.211 Pharmaceutical Methodology**

Prereq. 12.142; 3 Cl.; 3 Lab.; 4 Q.H.

Application of fundamental principles and methods involved in the formulation of pharmaceuticals, including official preparations; pharmaceutical calculations.

**71.212 Pharmaceutical Preparations**

Prereq. 71.211; 3 Cl.; 3 Lab.; 4 Q.H.

Classes of official preparations and individual dosage forms, based on physical-chemical principles on an introductory level; pharmaceutical calculations.

**71.221 Physical Pharmacy**

Prereq. 71.212; 3 Cl.; 3 Lab.; 4 Q.H.

Application of physical-chemical principles and laws to pharmaceutical systems; solution kinetics and stability, colloidal dispersions, buffer systems, colligative properties, aerosols, compression characteristics of solid dosage forms.

**71.222 Pharmaceutical Technology**

Prereq. 71.221; 3 Cl.; 3 Lab.; 4 Q.H.

Application of all principles studied in previous courses in pharmacy to selected preparations; compound dosage forms, sustained action preparations, tablet coating, parenterals, coloring and flavoring agents.

**71.223 Business Law**

4 Cl.; 4 Q.H.

A comprehensive study of the legal aspects relative to the operation of retail pharmacies; the problems of contracts, agency, negotiable instruments, business organizations and leases.

**71.232 Prescription Pharmacy**

Prereq. 71.222; 4 Cl.; 3 Lab.; 5 Q.H.

A correlation and integration of the previous instruction in the development of the pharmacist as a professional person. The compounding and dispensing of solid and semi-solid dosage forms of medication; the objectives of the course are to develop in the student: the ability to understand and interpret prescriptions, skill in compounding prescriptions, ability to evaluate and correct prescriptions from a pharmaceutical point of view, appreciation of the legal aspects of prescription practice, and an increased understanding of the use of drugs. Prescription clinic.

**71.233 Prescription Pharmacy**

Prereq. 71.232; 4 Cl.; 3 Lab.; 5 Q.H.

The content is similar to 71.232 but liquid dosage forms of medication are discussed. Advanced compounding techniques applied to prescription practice; systematic study of prescription incompatibilities; development of a professional attitude and a sense of professional responsibility in interprofessional and public relations. The prescription clinic, with emphasis on prescription specialties, is continued.

**71.234 Pharmaceutical Jurisprudence**

3 Cl.; 3 Q.H.

Federal and state laws that regulate the practice of pharmacy; emphasis on the Food and Drug Act; narcotic laws; the rules and regulations of the Board of Pharmacy.

**71.237 Drug Marketing**

Prereq. 71.234; 4 Cl.; 4 Q.H.

An analysis and study of the basic marketing concepts and their application to the promotion and distribution of goods as they relate to pharmacy. Emphasis is placed on packaging, advertising, channels of commerce, and the laws affecting distribution. Case studies and seminars supplement the lecture series.

**71.238 Retail Pharmacy Management**

Prereq. 41.208, 71.223, 71.237; 4 Cl.; 4 Q.H.

A comprehensive study of the operation of a retail pharmacy. Topics covered will include the planning, organizing, financing, control, personnel, and policy determination of a modern pharmacy. Due emphasis is placed on buying, merchandising, and the promotion of goods. The lectures will be supplemented with case studies and practice in our Professional (Gillette) Pharmacy.

## MEDICINAL CHEMISTRY

**72.221 Inorganic Medicinals** Prereq. 12.126; 4 Cl.; 4 Q.H.  
 Source, methods of manufacture, properties, uses, and compounding of inorganic medicinals; relationship between electronic structure and physiological activity of ions; radioisotopes in pharmacy; the role of inorganic ions in preservation and stabilization of pharmaceuticals.

**72.222 Drug Analysis** Prereq. 12.174; 4 Cl.; 4 Lab.; 5 Q.H.  
 Principles of quantitative analysis applied to natural or synthetic chemicals and drugs used in pharmacy and medicine; emphasis on the instrumental and chromatographic methods used in the official compendia.

**72.231 Organic Medicinals** Prereq. 12.143; 4 Cl.; 4 Q.H.  
 Modern synthetic drugs and natural products of medicinal importance; uses, syntheses, incompatibilities, correlation of physical properties, structures and biological activity.

**72.232 Organic Medicinals** Prereq. 72.231; 3 Cl.; 3 Q.H.  
 Continuation of 72.231.

**72.233 Organic Medicinals** Prereq. 72.232; 3 Cl.; 3 Q.H.  
 Continuation of 72.232.

## PHARMACOLOGY AND PHARMACOGNOSY

**73.221 Pharmacognosy** Prereq. 18.113, 12.143; 4 Cl.; 3 Lab.; 5 Q.H.  
 Introduction to the natural products of biological origin which are of pharmaceutical and medicinal significance; their gross characteristics and active constituents; macroscopic and microscopic identification including selected physical and chemical methods; a biochemical approach based upon the general chemical groups of the major constituents.

**73.231 Pharmacology** Prereq. 18.159, 73.221; 3 Cl.; 3 Lab.; 4 Q.H.  
 Fundamental relationships and principles associated with the pharmacological characteristics of drugs; basic toxicology and essential emergency procedures; agents used topically or affecting the skin or the mucous membranes; gastro-intestinal, nutritional and dietary agents.

**73.232 Pharmacology** Prereq. 73.231; 3 Cl.; 3 Lab.; 4 Q.H.  
 Basis of chemotherapy and systemic anti-infective agents; drugs affecting the central nervous system; diagnostics.

**73.233 Pharmacology** Prereq. 73.232; 3 Cl.; 3 Lab.; 4 Q.H.  
 Agents acting on the peripheral nervous system; cardiovascular, renal and hematopoietic system drugs; agents affecting the endocrine and reproductive functions.

**73.237 Pharmacognosy** Prereq. 73.221, 18.120; 3 Cl.; 3 Q.H.  
 A continuation of 73.221 with special emphasis upon products obtained from animals and microorganisms to be used for immunological and antibiotic purposes. A discussion of allergenic plants and substances along with the different types of pesticides.

# Nursing

**Professor and Dean**

Charlotte E. Voss, R.N., Ed.D.

**Associate Professors**

Lydia A. Bosanko, R.N., M.A.

Goldie Crocker, R.N., D.Ed.

Jean L. Cushman, R.N., M.S.

Mary E. Gonyow, R.N., M.A.

Mary A. Space, R.N., M.A.

**Assistant Professors**

Dolores C. Chuma, R.N., M.S.

Flora M. DeScenza, R.N., M.S.

Jeanne B. Dorie, R.N., M.A.

Janet A. Finnegan, R.N., M.S.

O. Barbara Goodfellow, R.N., M.S.

Marjorie P. Johns, R.N., M.S.

**Assistant Professors (continued)**

Beverly J. Konchagulian, R.N., M.S.

Juanita O. Long, R.N., M.S.

Eunice C. Messler, R.N., M.A.

Mary C. Scahill, R.N., M.S.

Joyce E. Tingle, R.N., M.S.

**Instructors**

Carolyn F. Brokvist, R.N., M.S.

Nancy L. Gegan, R.N., M.S.

Jane E. Graydon, R.N., M.S.

Doris E. Hibel, R.N., M.S.

Carol F. Hogan, R.N., B.S.

Mary P. A. Kane, R.N., M.S.

E. Lorraine Middleton, R.N., M.S.

Helen M. Rogers, R.N., M.S.

Mary E. Wilcox, R.N., M.S.

**80.100 Introduction to Nursing**

4 Cl.; 4 Lab.; 5 Q.H.

Acquaints the student with the evolution of nursing and its role in society today. Emphasis is placed on the latter in discussions of preparation for nursing responsibilities inherent in the nursing role, and events that are influencing nursing practice as it is today and projected for the future.

**80.101 Fundamentals of Nursing**

Prereq. 80.100; 4 Cl.; 4 Lab.; 5 Q.H.

Basic to all other courses in nursing. Focus is on the patient as an individual. Underlying this is the concept of homeostasis and the role of the nurse in meeting human needs. Nursing action is based upon principles drawn from the behavioral, social and biological sciences. Assignments in patient care are designed to provide the student with opportunities to interpret these principles in the promotion of health and prevention of illness.

**80.102 Fundamentals of Nursing**

Prereq. 80.100, 80.101; 4 Cl.; 4 Lab.; 5 Q.H.

Continuation of first-quarter course.

**80.103 Fundamentals of Nursing**

Prereq. 80.100, 80.101, 80.102; 4 Cl.; 4 Lab.; 5 Q.H.

Continuation of second-quarter course.

**80.201 Nursing**

2 Cl.; 3 Lab.; 3 Q.H.

Introduction to the sociological perspective that is continued throughout the curriculum. Orientation to social systems and their influence on the student and the individuals for whom she will care in her role as a nurse.

Major emphasis is placed on those societal institutions which are concerned with health. Laboratory experiences include group discussions and field trips to selected health agencies.

**80.202 Nursing** Prereq. 80.201; 2 Cl.; 3 Lab.; 3 Q.H.  
Continuation of first-quarter course.

**80.203 Nursing** Prereq. 80.201, 80.202; 2 Cl.; 3 Lab.; 3 Q.H.  
Continuation of second-quarter course.

**80.204 Nursing** Prereq. 80.203; 4 Cl.; 3 Lab.; 5 Q.H.  
Clinical nursing practice is introduced in the second year. It is focused on the basic health needs that are common to all people. It is presented through the study of principles and concepts essential to the practice of nursing.

**80.205 Nursing** Prereq. 80.204; 4 Cl.; 3 Lab.; 5 Q.H.  
Continuation of 80.204.

**81.101 Medical-Surgical Nursing** Prereq. 80.103; 6 Cl.; 15 Lab.; 11 Q.H.  
Utilizing the concept that all illnesses produce alterations in body function, the student is introduced to selected conditions requiring medical and/or surgical intervention. Major emphasis in classroom and clinical instruction is upon the nurse's role in meeting patients' physical and psychosocial needs, further developing nursing techniques, and learning specific skills needed to care for assigned patients.

**81.102 Medical-Surgical Nursing** Prereq. 81.101, 82.101; 3 Cl.; 9 Lab.; 6 Q.H.  
A presentation of major health problems which may bring about grave deviations in homeostasis or threaten life. Emphasis is placed on the acute phases of these problems necessitating radical surgery, chemotherapy or radiation therapy. Classroom and clinical experiences focus on the understandings and skills involved in providing complex nursing care for selected patients.

**82.101 Maternal and Child Health** Prereq. 80.103; 6 Cl.; 18 Lab.; 12 Q.H.  
Focuses on the family and individual and family developmental tasks. Emphasis is on positive health practices within the family-unit and on specific nursing care needed by the mother, newborn, and children of all ages. Disease conditions characteristic of childhood are the basis for the study of sick children.

**83.100 Psychiatric Nursing** Prereq. 81.100, 82.100; 3 Cl.; 9 Lab.; 6 Q.H.  
Assists the student to acquire additional knowledge of human behavior; to provide the opportunity to achieve understanding of selected human motivations and defenses and to learn additional interpersonal skills which may be used in the nursing care of patients. The opportunity to apply this knowledge; to observe and analyze behavior and to practice the skills is offered in supervised laboratory sessions.

## Department of Cooperative Education

### **Professors**

Thomas E. McMahon, Director, B.S., M.Ed.  
Sidney F. Austin, Associate Director, B.S., M.Ed.

### **Associate Professors**

Joseph E. Barbeau, B.S., M.Ed.  
Ernest V. Barrasso, B.S., M.Ed.  
Nancy J. Caruso, B.S., M.Ed.  
Paul E. Dubé, B.S., M.A.  
Philip W. Dunphy, B.S., M.Ed.  
Charles F. Field, B.S., M.Ed.  
Kenneth R. Hancock, Jr., B.S.  
Homer C. Littlefield, B.S.  
Paul M. Pratt, B.S., M.Ed.  
Harold P. Watts, B.S., M.Ed.

### **Assistant Professors**

George K. Howe, B.S.  
Robert W. Miller, B.S., M.Ed.  
John A. Orphanos, B.S.  
Ralph C. Porter, B.S.  
Everett R. Rand, B.S., M.S.  
Roderic W. Sommers, B.S.

### **Instructors**

Peter H. Akin, B.S.  
George H. Baillie, B.S.  
John Dromgoole, B.S., M.Ed.  
Mary R. Flynn, B.S.  
Jane S. Schachter, B.S.

### **90.251 Placement Techniques**

1 Cl.; 1 Q.H.

Career selection and development are discussed concurrently with methods of achieving career goals. Techniques of resumé preparation, personal presentation, and effective written communication are treated to facilitate the planning and implementation of a professional career program.

### **90.252 Professional Development**

2 Cl.; 1 Q.H.

Career selection and development are discussed concurrently with methods of achieving career goals. Techniques of resumé preparation, personal presentation and effective written communication are treated to facilitate the planning and implementation of a professional career program.

Professional engineers and the appropriate department chairmen discuss the professional and ethical aspects of engineering, including: Engineering, Licensure, U. S. Patent System, Ethics in Engineering Practice, and the activities of ECPD and EJC.

### **90.253 Professional Development for Teachers**

1 Cl.; 1 Q.H.

Teaching as a profession is discussed concurrently with methods of achieving career goals by developing the techniques of resumé preparation, effective oral and written communication, and the interviewing process. Topics affecting professional growth, such as teacher certification, professional ethics and professional development, will be examined. College of Education faculty will discuss the various aspects of professionalism.

### **90.254 Professional Development for Nurses**

1 Cl.; 2 Q.H.

**90.254 Professional Development for Nurses**

1 Cl.; 1 Q.H.

Nursing as a profession is discussed concurrently with methods of assisting the senior to assume her role as a graduate nurse. Topics relative to personal, legal, and professional responsibilities are examined as well as techniques of résumé preparation, effective oral and written communication and personal presentation.

## Interdisciplinary Courses

**90.100 Introduction to Engineering (Freshman Orientation)**

1 Cl.

Instructs the student in the traditions, activities and procedures at the University; proper methods of study; attitudes needed for success; techniques and procedures of work under the Cooperative Plan.

**90.101 Introduction to Engineering (Freshman Orientation)**

1 Cl.; 1 Q.H.

A history of engineering, to provide a better understanding of the various fields of engineering; to add perspective and motivation toward engineering careers, and to assist the students in selecting a particular branch of engineering.

**90.201 Great Issues in Social Science**

3 Cl.; 3 Q.H.

An interdisciplinary course in which the data and methods of the social sciences will be employed in the analysis of specific issues. Specialists from the Departments of Economics, History, Political Science, Psychology, and Sociology and Anthropology will participate.

## Criminal Justice

### Associate Professors

Robert Sheehan, Acting Dean, A.B., M.A.  
Frederick Cunliffe, B.S., M.S., Ph.D.

#### 92.101, 92.102, 92.103 Introduction to Criminal Justice

(each) 1 Cl.; 1 Q.H.

A survey of the evolution of justice from earliest times, developed historically, with particular emphasis on Western justice and American justice, including the roles played by the judiciary; federal law enforcement; correctional institutions; probation and parole agencies; state police and state investigative organizations; and county and municipal police departments.

#### 92.110 Police-Community Relations

3 Cl.; 3 Q.H.

Police-public contact; uses of the communications media in projecting the police image; responsibilities of police in dealing effectively with minority groups, civil rights, civil disorder, and public protection. An exploration of the role and function of the police in inter-group relations.

#### 92.111 Police Patrol

3 Cl.; 3 Q.H.

The fundamentals of foot, vehicular, water, and air patrol by uniformed police; deployment of personnel; beat layouts; mechanics of arrest; riot control; raids; stopping methods; and the transportation of prisoners.

#### 92.121 Civil Liberties: Substantive Rights

3 Cl.; 3 Q.H.

Utilizing Supreme Court decisions and other sources, this course will encompass a study of the constitutional rights of speech, press, religion, association, equal protection of the laws, and their relevance to a democratic society.

#### 92.122 Criminal Law: Procedural Due Process

3 Cl.; 3 Q.H.

Utilizing current Supreme Court decisions and other sources, this course will examine the relationship between the Bill of Rights and the States, with primary emphasis on the guarantees of fair trial, counsel, privacy, immunity from self-incrimination, and other constitutional safeguards in state and federal criminal proceedings.

#### 92.123 Criminal Investigation and Case Preparation

3 Cl.; 3 Q.H.

Crime scene procedure; collection and preservation of evidence; recording the crime scene; surveillance; investigative techniques; and methods of preparing a case for court.

#### 92.124 Court Procedure

3 Cl.; 3 Q.H.

Fundamentals of court room procedure; testifying in court; the principles of prosecuting a case; the introduction of evidence. Role-playing is used as a learning device in mock trials. Class members are required to attend and report on criminal trials.

**92.125 Evidence** 3 Cl.; 3 Q.H.  
Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof; competency; consideration of witnesses.

**92.131 Investigative Report Writing** 3 Cl.; 3 Q.H.  
Determining report content through interpretation and evaluation of information. Emphasis is placed on collection of information, accurate description, analysis of information, and concise writing. The student is required to participate in numerous report-writing projects.

**92.132 Interviews and Interrogation** 3 Cl.; 3 Q.H.  
The questioning of suspects, witnesses, victims, informants, and complainants; laws governing interrogation practices; techniques for legally and morally acceptable interrogation procedures. Mock cases are used so that all class members have an opportunity to interrogate or interview under simulated conditions.

**92.133 Introduction to Criminalistics** 2 Cl.; 2 Lab.; 3 Q.H.  
A survey of the elements of microscopy, spectroscopy, and basic chemistry as they apply to the study of firearms, hair, fibers, blood, paint, tools, glass, documents, laundry marks, poisons, and other materials which comprise physical evidence.

**92.134 Police Juvenile Methods** 3 Cl.; 3 Q.H.  
The role of the police in crime prevention, with emphasis on theory, administration, control, treatment, confinement, community resources, relations with the public, and the juvenile court.

**92.135 Identification and Records in Law Enforcement** 3 Cl.; 3 Q.H.  
Observation and description; handwriting and typewriter identification; fingerprinting; records systems and utilization; concentration on theoretical and practical applications.

**92.141 Traffic Law Enforcement** 3 Cl.; 3 Q.H.  
Accident prevention and investigation; traffic surveys; selective enforcement; traffic engineering; administration of traffic divisions; and traffic safety education.

**92.142 Police Supervision** 3 Cl.; 3 Q.H.  
The police supervisor's role in discipline; intradepartmental relations, problem-handling and personnel policies. Problems relating to supervisory relationships, wages, grievances, morale, and safety.

**92.143 Law Enforcement Administration and Management** 3 Cl.; 3 Q.H.  
The principles of police organization, administration and management, including staff and line functions, chain of command, span of control, selection of personnel and promotional systems. Consideration is also given to special problems such as strikes, natural and atomic disasters, narcotic traffic and vice control.

**92.144 Police Planning** 3 Cl.; 3 Q.H.  
The purpose, need, and scope of planning in the police operation; establishing and staffing a planning bureau; collection and evaluation of statistical data; and the use of data processing in planning procedures.

**92.145 Computer Technology in Law Enforcement** 3 Cl.; 3 Q.H.  
A survey to acquaint the future police executive with automatic electronic equipment and its potential applications, including a comprehensive overview of machine components, their characteristics and assembly; comparison of speed, capacity, flexibility, reliability, and cost; discussion of input and output devices, memory, arithmetic and control elements; elementary programming; and number systems.

**92.150 Research Methods in Law Enforcement** 3 Cl.; 3 Q.H.  
An opportunity for each student to conduct a research project with the supervision and guidance of his class instructor. The project must be specifically related to a police interest or operation. Various research methods are analyzed and discussed. Progress reports are due periodically, and a paper is required.

**92.151 Seminar in Law Enforcement** 3 Cl.; 3 Q.H.  
An opportunity for free discussion about the numerous problems facing the law enforcement officer. Periodic oral and written reports are required. Guest lecturers are invited to participate in and lead discussion sessions. An effort is made to have each student formulate his own philosophy of law enforcement immediately prior to his graduation.

## MILITARY SCIENCE (ROTC)

**Professor**

Frederic H. Palmblad, Col, USA,  
A.B.. Chairman

**Associate Professor**

Dwight O. Henderson, LTC, USA, B.S.

**Assistant Professors**

Boreslaw P. Berestecky, Major,  
USA, B.S.

Horace W. Brown, Major, USA,  
B.S., M.Ed.

Joseph H. Cordella, Major, USA,  
B.S.

Charles D. Herb, Major, USA,  
B.S.

Harry Z. Kageleiry, Major, USA,  
B.S.

Robert J. Laflam, Major, USA,  
B.S., B.S.E.E.

Michael Volpe, Major, USA,  
B.E.E., M.S.C.E.

Charles J. Fincher, Cpt, USA,  
B.S., M.Ed.

**Assistant Professors (continued)**

Samuel L. Gwin, Cpt, USA, B.A.  
Lawrence R. Hawkins, Cpt, USA,  
B.S.

James J. Nolan, Cpt, USA, B.S.  
Robert W. Patch, Cpt, USA, B.A.

Robert J. Strickland, Cpt, USA,  
B.S. in Bus. Admin.

Robert E. Walsh, Cpt, USA, B.A.

**Instructors**

Marvin B. Manning, SGM, USA  
Craven A. Covington, MSG, USA  
Armand J. Parenteau, MSG, USA  
Edward G. Clark, SFC, USA  
Lloyd M. Hendrix, SFC, USA  
Yukimitsu Higashidani, SFC, USA  
Fred D. McMillan, SFC, USA  
John T. Oliver, SFC, USA  
David Cole, SSG, USA  
Harold G. Shields, SSG, USA  
Frederick C. Shaffer, SSG, USA  
Stanley J. Tomsick, SSG, USA  
Thomas L. Ryan, SP5, USA

**91.101 Military Science I**

3 Cl.; 1 Q.H.

Organization of the Army and ROTC; care of the uniform and rifle, military courtesy, discipline and drill; relationships of U.S. Army and national security.

**91.102 Military Science I**

Prereq. 91.101; 3 Cl.; 1 Q.H.

Instruction in individual weapons and marksmanship; principles of military map reading and aerial photograph interpretation.

**91.103 Military Science I**

Prereq. 91.102; 1 Cl.; 2 Lab.; 1 Q.H.

Cadet brigade drill; orientation in chemical, biological and radiological warfare; first aid.

**91.104 Military Science II**

Prereq. 91.103; 3 Cl.; 1 Q.H.

Military history and the principles of war; counterinsurgency operations.

**91.105 Military Science II**

Prereq. 91.104; 1 Cl.; 2 Lab.; 1 Q.H.

Cadet brigade drill; small unit tactics and techniques.

<b>91.106 Military Science III</b>	Prereq. 91.105; 3 Cl.; 2.5 Q.H. Leadership techniques; small unit operations and tactics.
<b>91.107 Military Science III</b>	Prereq. 91.106; 1 Cl.; 2 Lab.; 2.5 Q.H. Cadet brigade drill; orientation in branches of Army; service orientation.
<b>91.108 Military Science III</b>	Prereq. 91.107; 3 Cl.; 2.5 Q.H. Military teaching methods; unit operations; Army Staff relationships.
<b>91.109 Military Science IV</b>	Prereq. 91.108; 1 Cl.; 2 Lab.; 2.5 Q.H. Cadet brigade drill; principles of communication; counterinsurgency operations.
<b>91.110 Military Science IV</b>	Prereq. 91.109; 3 Cl.; 2.5 Q.H. Military logistics; Army administration techniques; role of U.S. in world affairs.
<b>91.111 Military IV</b>	Prereq. 91.110; 2 Cl.; 1 Lab.; 2.5 Q.H. Principles of military law; review of map reading; service orientation; leadership techniques.

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It is suggested that, when possible, those contemplating gifts or bequests confer with the President of the University regarding the University's needs before legal papers are drawn.

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**ACADEMIC CALENDAR FOR BASIC COLLEGES IN 1967-1968**

September 12 (Tuesday)	Freshman Registration — Beginning of Orientation Period
September 18 (Monday)	Upper-Class Registration — Beginning of Fall Quarter for Division A Students and Freshmen —Changeover Date—beginning of Fall Quarter Co-op Term
<i>No Classes on the following holidays during the Fall Quarter:</i>	
	October 12 (Thursday)
	November 23 and 24 (Thursday and Friday)
November 27-28 (Monday-Tuesday)	Thursday and Friday Class Schedules in effect
November 29 (Wednesday)	No classes
November 30—December 6 (Thursday-Wednesday)	Final Examination Period for Fall Quarter
December 7-8 (Thursday-Friday)	No examinations scheduled
December 11 (Monday)	Registration — Beginning of Winter Quarter for Division B Students and Freshmen — Changeover Date — Beginning of Winter Quarter Co-op Term
December 23—January 1 (Saturday-Monday)	Christmas Vacation — No Classes
February 22 (Thursday)	Holiday — No Classes
March 4-8 (Monday-Friday)	Final Examination Period for Winter Quarter
March 11-15 (Monday-Friday)	Vacation for Freshmen and Division B Students
March 18 (Monday)	Registration — Beginning of Spring Quarter for Division A Students and Freshmen — Changeover Date — Beginning of Spring Quarter Co-op Term
<i>No Classes on the following holidays during the Spring Quarter:</i>	
	April 19 (Friday)
	May 30 (Thursday)
June 3-7 (Monday-Friday)	Final Examination Period for Spring Quarter
June 10-14 (Monday-Friday)	Vacation for Division A Students
June 16 (Sunday)	Commencement
June 17 (Monday)	Registration — Beginning of Summer Quarter for Division B Students and Freshmen in Summer Quarter — Changeover Date — Beginning of Summer Quarter Co-op Term
July 4 (Thursday)	Holiday — No Classes
August 29 (Thursday)	No Classes
August 30—September 6 (Friday-Friday)	Final Examination Period for Summer Quarter

**ACADEMIC CALENDAR (Cont.)**

September 2 (Monday)	Holiday — No Classes
September 9-13 (Monday-Friday)	Vacation for Division B Students
September 10 (Tuesday)	Freshman Registration (Class of 1973) — Beginning of Orientation Period
September 16 (Monday)	Upper-Class Registration for Fall Quarter (Division B)

Note: No Classes on Registration Days

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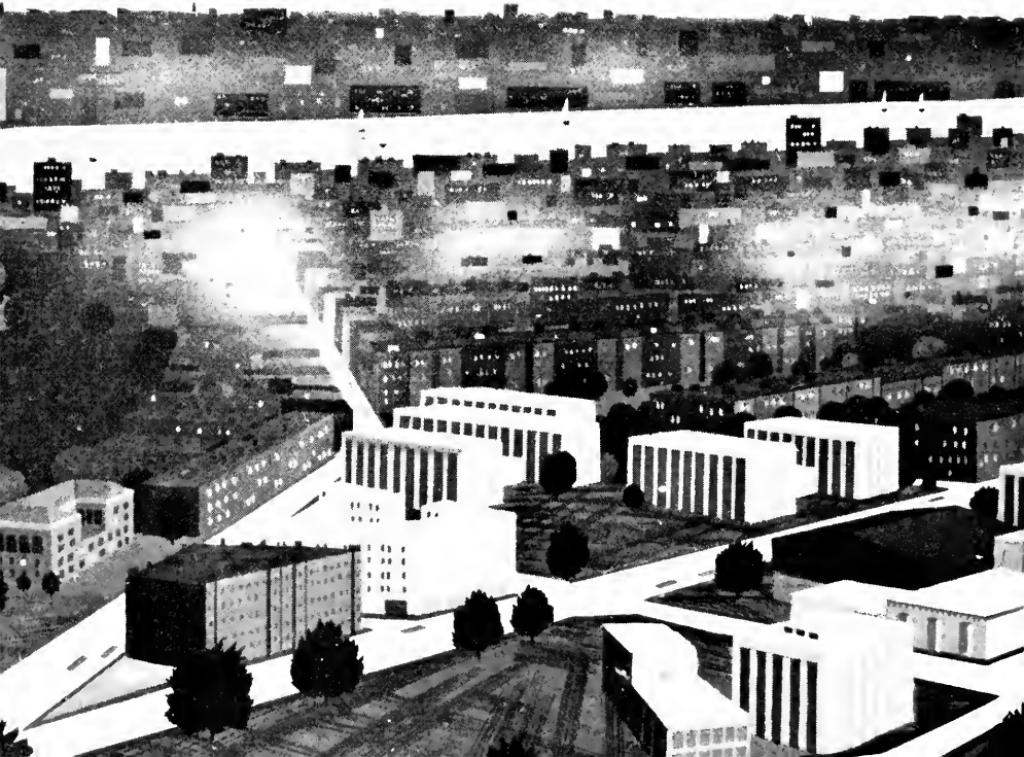
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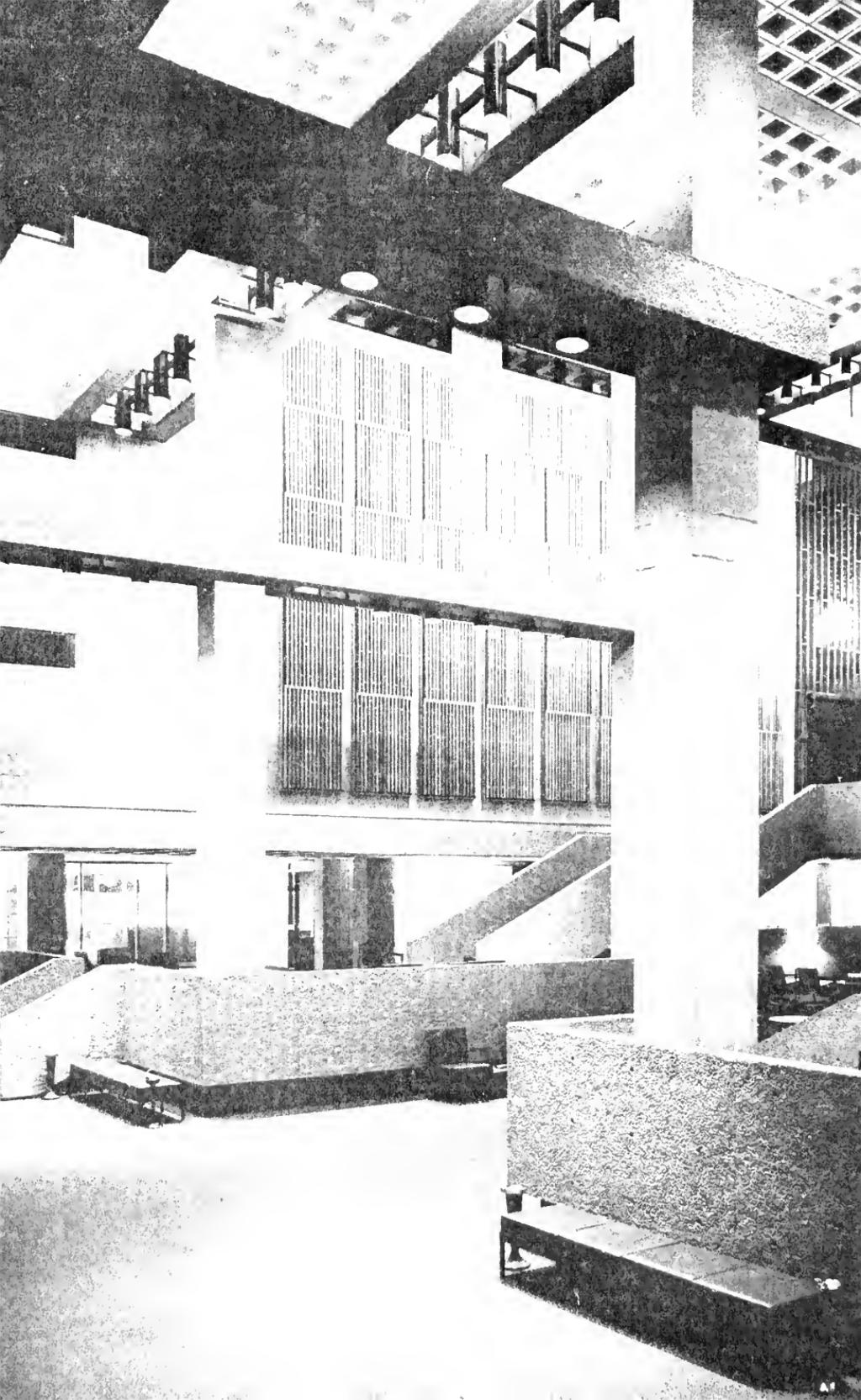
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# **university college**

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## **Part-Time Undergraduate Programs 1967-68**

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- health-related programs
- law enforcement
- liberal arts



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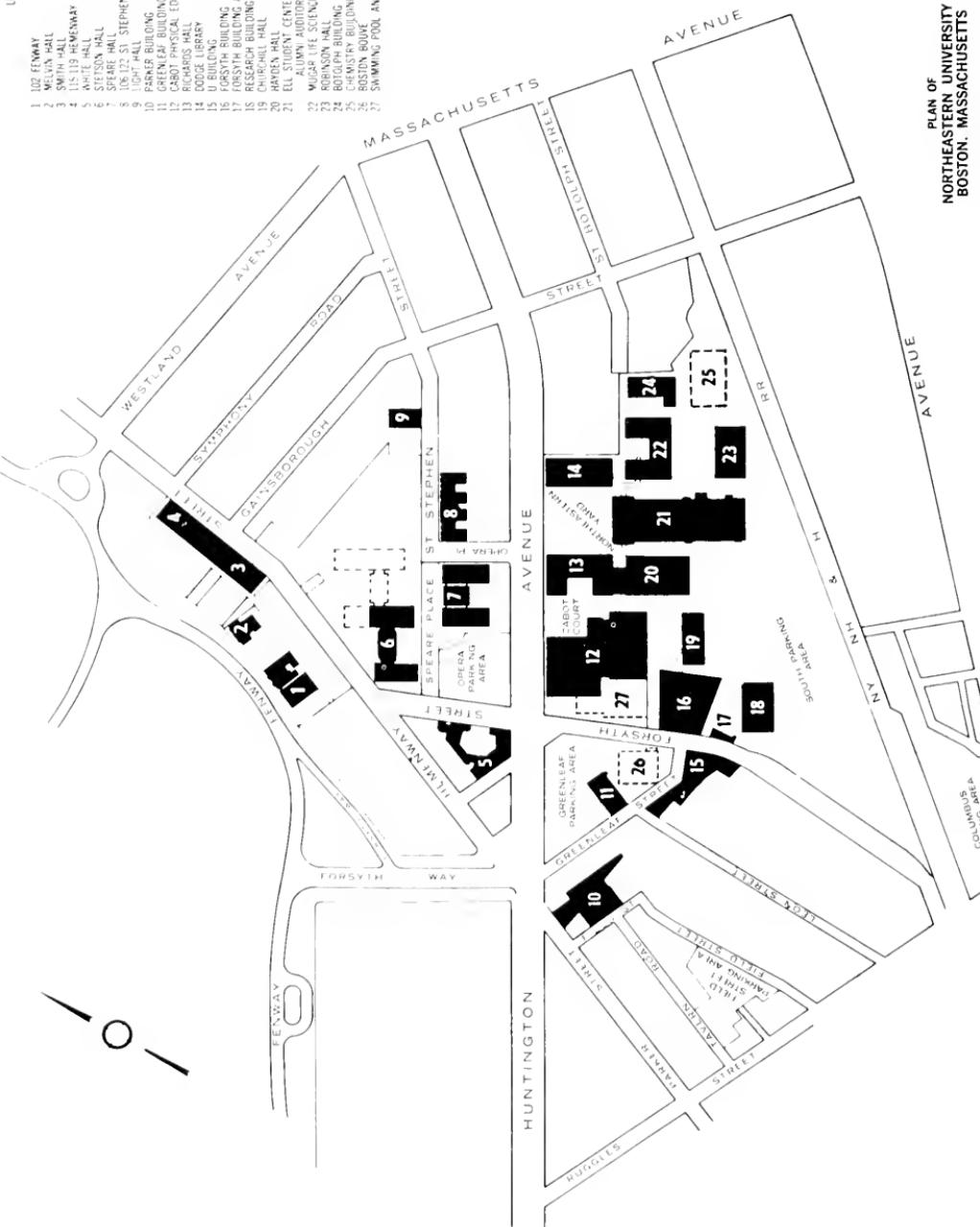
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- 2 MCILVAN HALL
- 3 SMITH HALL
- 4 1119 FENWAY STREET
- 5 WHITE HALL
- 6 SITSON HALL
- 7 SPARE HALL
- 8 108-122 ST. STEPHEN STREET
- 9 LIGHT HALL
- 10 PARKER BUILDING
- 11 GREEN GATE BUILDING
- 12 CABOT PHYSICAL EDUCATION CENTER
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PLAN OF  
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BOSTON, MASSACHUSETTS

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# university college offices

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Telephone 262-1100

Office for General Information	219 Hayden Hall	Extension 761
Office of the Registrar	120 Hayden Hall	Extension 291

## Regular Office Hours

Boston	Monday—Friday Saturday	8:30 a.m.—8:30 p.m. 8:30 a.m.—12 noon
Burlington	Monday—Friday Saturday	8:00 a.m.—10:00 p.m. 8:00 a.m.—1:00 p.m.
Framingham North High School	Monday—Thursday	5:30—10:00 p.m.
Lynn English High School	Monday—Thursday	5:30—10:00 p.m.
Weymouth High Schools	Monday—Thursday	5:30—10:00 p.m.

## Summer Office Hours

Boston 219 Hayden Hall	Monday—Thursday Friday Saturday	8:30 a.m.—8:30 p.m. 8:30 a.m.—4:30 p.m. Closed
120 Hayden Hall	Monday—Friday Saturday	8:30 a.m.—8:30 p.m. 8:30 a.m.—12 noon
Burlington	Monday—Friday Saturday	8:00 a.m.—10:00 p.m. 8:00 a.m.—1:00 p.m.

## Program Advisers

Program advisers are available each evening by appointment in the University College Office. These faculty members are competent to assist the student in planning a program suitable to his general educational and career objectives. They can also answer questions relating to degree requirements, course sequence, and proper scheduling of courses. Appointments may be arranged by calling the University College Office (262-1100, Ext. 761) or by coming in person to 219 Hayden Hall. There is no charge for this service.

Program advisers are also available during registration at all registration sites. No appointment is necessary.

## Counseling and Testing Center

Adult students attending Northeastern University may arrange appointments for counseling and testing services by telephoning 262-1100, Ext. 617, or by going to the Counseling and Testing Center, 302 Ell Student Center. Professional counselors are available certain evenings until 8:30.

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# 1967-1968 academic calendar

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## Fall Quarter 1967

Classes begin September 18

### FALL REGISTRATION

Boston—Senior students	5:30-9:00 p.m.	September 5
Former students	5:30-9:00 p.m.	September 6-8
	9:00 a.m.-12 noon	September 9
New students	5:30-9:00 p.m.	September 11-15
	9:00 a.m.-12 noon	September 16
Burlington—	12 noon-8:30 p.m.	August 29-31
	5:30-9:00 p.m.	September 12 and 14
Lynn English High School	5:30-9:00 p.m.	September 11 and 13
Weymouth and Framingham	5:30-9:00 p.m.	September 5-7
Classes begin		September 18
Columbus Day	No classes	October 12
Veterans' Day	No classes	November 11
Thanksgiving recess	No classes	November 23-25
Final Examination period for Fall Quarter		December 4-9

---

## Winter Quarter 1967-68

Classes begin December 11

### WINTER REGISTRATION

Boston	5:30-9:00 p.m.	December 4-8
	9:00-12 noon	December 9
Burlington	12 noon-8:30 p.m.	December 1
Lynn English High School	5:30-9:00 p.m.	December 6
Weymouth	5:30-9:00 p.m.	December 5
Framingham	5:30-9:00 p.m.	December 7
Classes begin		December 11
Christmas vacation	No classes	December 23-January 1
Washington's Birthday		February 22
Final Examination period for Winter Quarter		March 4-9

**Spring Quarter 1968**

Classes begin March 18

**SPRING REGISTRATION**

Boston	5:30–9:00 p.m.	March 4–8
	9:00–12 noon	March 9
Burlington	12 noon–8:30 p.m.	March 1
Lynn English High School	5:30–9:00 p.m.	March 6
Weymouth	5:30–9:00 p.m.	March 5
Framingham	5:30–9:00 p.m.	March 7
Spring Recess		March 11–16
Spring Quarter begins		March 18
Patriots' Day	No classes	April 19
Memorial Day	No classes	May 30
Final Examination period for Spring Quarter		June 3–8
Commencement		June 16

---

**Summer Quarter 1968**

Segment 1		June 17–July 12
Segment 2		July 15–August 9
Segment 3		August 12–September 6

**REGISTRATION FOR ENTIRE SUMMER TERM**

Boston	4:30–9:00 p.m.	June 10–14
	9:00–12 noon	June 15
Burlington	12 noon–8:30 p.m.	June 11

**REGISTRATION FOR SEGMENT 2**

Boston	12 noon–8:30 p.m.	July 15
Burlington	12 noon–8:30 p.m.	July 15

**REGISTRATION FOR SEGMENT 3**

Boston	12 noon–8:30 p.m.	August 12
Burlington	12 noon–8:30 p.m.	August 12

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Martin W. Essigmann, S.B., M.S.	Dean of Research
Albert E. Everett, B.S., M.B.A., D.C.S.	Dean of Continuing Education
Gilbert C. Garland, B.S., Ed.M., Ed.D.	Dean of Admissions
James E. Gilbert, B.S., M.A., Sc.D.	Director of the Office of Educational Resources
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James S. Hekimian, A.B., M.B.A., D.B.A.	Dean of Business Administration
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Wilfred S. Lake, A.B., M.A., Ph.D.	Dean of Liberal Arts
Minnie L. Lynn, A.B., M.S., Ph.D.	Dean of Boston-Bouvé College
Frank E. Marsh, Jr., A.B., M.Ed., D.Ed.	Dean of Education
Roland H. Moody, A.B., B.L.S.	Director of the University Library
Rudolph M. Morris, B.S., Ed.M.	University Registrar
Gustav S. Rook, B.S., Ed.M.	Dean of Lincoln College
Ronald E. Scott, B.S., M.A., Sc.D.	Dean of Engineering
Robert Sheehan, A.B., M.A.	Acting Dean of Criminal Justice
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Charlotte E. Voss, B.S., M.S., Ed.D.	Dean of Nursing
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## **UNIVERSITY COLLEGE ADMINISTRATIVE OFFICERS**

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William T. Edgett, B.A., M.A.	Assistant Dean and Director of Admissions
Donald W. Lovejoy, A.B., M.A., Ph.D.	Assistant Dean, Liberal Arts
Richard D. MacPherson, B.S., M.B.A.	Assistant Dean, Business Administration
James R. Bryant, B.S., B.D., S.T.M., Ed.D.	Director of Counseling and Special Programs
Virginia Bullard, B.S.	Director, Women's Programs
Stephen G. Burke, LL.B.	Director of Placement
Edmund J. McTernan, M.S., M.P.H., F.A.P.H.A., F.A.C.H.A.	Chairman, Allied Medical Sciences
Timothy F. Moran, B.S.	Chairman, Law Enforcement and Security
Edmund J. Mullen, A.B.	Registrar
John L. O'Leary, Jr., B.S.	Assistant Registrar
E. Forest Hallet, B.S., M.B.A.	Admissions Officer
Ralph T. Vernile, Jr., B.S.	Director, Administrative Services
Jane E. Pond, A.B., C.P.S.	Assistant to the Dean
Franklin R. Berkey	Assistant Director of Student Activities
Donald K. Tucker, B.S., M.Ed.	Director, Career Information Center

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Louis Cooperstein	Harry Olins
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Walter L. Fogg	Stanley O. Robinson
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Frank F. Lee	Donald K. Tucker
Donald W. Lovejoy	Harvey Vetstein
Richard D. MacPherson	Rowell L. Waller, Jr.
Thomas J. McNamara	Robert L. Wells
James M. Moore	Edward R. Willett

Steve Worth

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# aims and scope of the university

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Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. By special enactment, the State Legislature has given the University general degree-granting powers. The University is governed by a Board of Trustees elected by and from the Northeastern University Corporation, which comprises more than 150 distinguished business and professional men.

From its beginning Northeastern University's dominant purpose has been to identify community educational needs and to meet these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has pioneered new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, under which students alternate periods of work and study. The Plan was initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), and the College of Criminal Justice (1967).

This time-tested method of education offers students the opportunity to gain valuable practical experience as an integral part of their college programs and also enables them to contribute substantially to the financing of their education. The "Co-op" Plan has been extended to the graduate level in engineering, mathematics, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

## UNDERGRADUATE COLLEGES

### BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study—Physical Education, Recreation, and Physical Therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching as well as leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Co-operative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the Bachelor of Science degree in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

The Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

### COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers a full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

### COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed to prepare students for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides employment in libraries, social service agencies, and school systems.

## **COLLEGE OF ENGINEERING**

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours part-time programs leading to Bachelor of Science degrees in Civil and Electrical Engineering. These programs extend over eight years, cover the identical courses given in the day co-operative curricula, and meet the same qualitative and quantitative standards of scholarship.

## **COLLEGE OF LIBERAL ARTS**

The College of Liberal Arts offers majors in the arts and sciences leading to the Bachelor of Arts degree. With the exception of preprofessional programs, curricula are normally five years in length and operate on the Co-operative Plan.

## **LINCOLN COLLEGE**

Lincoln College offers Associate and Bachelor degree programs in the evening on a part-time basis. Programs of study include Allied-Medical Technology, Civil Engineering Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, and Science Technology. Lincoln College and University College offer joint programs leading to the Bachelor of Science degree in Industrial Technology, Medical Technology, Chemical-Biological Technology, and Cytotechnology.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet the special needs of part-time students.

## **COLLEGE OF NURSING**

The College of Nursing offers two separate and distinct programs of study, both organized on the Co-operative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations, and leading to the Associate in Science degree.
- (b) A five-year curriculum in preparation for the R.N. Examinations, and leading to the Bachelor of Science degree in Nursing.

Five of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General—collaborate with Northeastern by providing suitable co-operative work opportunities during the students' upper-class years in these programs.

## **COLLEGE OF PHARMACY**

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, with the senior year devoted to full-time study at the University.

## **UNIVERSITY COLLEGE**

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement and Security, and Health-Related Programs, leading to the Associate in Science and Bachelor of Science degrees. Workshops and seminars are offered for degree credit. University College does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students.

In collaboration with Lincoln College, University College offers programs in Allied-Medical Technology and Science Technology leading to the Bachelor of Science degree. In co-operation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

## **GRADUATE DIVISION**

The Graduate Division, made up of the seven Graduate Schools listed below, offers day and evening degree programs. Some of these programs are offered on the Co-operative Plan and others provide teaching and research fellowships for able candidates.

### **ACTUARIAL SCIENCE**

Master of Science in Actuarial Science.

### **ARTS AND SCIENCES**

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, and Psychology.

### **BUSINESS ADMINISTRATION**

Master of Business Administration.

### **EDUCATION**

Master of Education.

## **ENGINEERING**

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both Bachelor's and Master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both Bachelor's and Master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

## **PHARMACEUTICAL SCIENCES**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

## **PROFESSIONAL ACCOUNTING**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

## **PROGRAMS FOR ADULT WOMEN**

These programs were developed to meet the needs of women with family or other obligations who wish to engage in part-time study during the day. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate Schools of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered. Men may enroll in most courses.

## **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working co-operatively with trade associations and professional societies, offers several programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## AFFILIATED PROGRAMS

### FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern University. After receiving the Associate degree, students may pursue the Bachelor of Science degree from University College on a part-time basis.

### FOR MEDICAL TECHNOLOGISTS AND CYTOTECHNOLOGISTS

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

Bachelor of Science degree programs in Medical Technology and Cytotechnology are offered jointly on a part-time basis by Lincoln College and University College in co-operation with several approved hospital schools.

### FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

## RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

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# **buildings and facilities**

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Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South Stations. To reach the University from the North Station, board an MBTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

## **HUNTINGTON AVENUE CAMPUS**

The principal educational buildings of Northeastern University are located on Huntington Avenue on 16 acres of a 47-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 4.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to nine new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The newer buildings are interconnected by means of tunnels.

In addition to classrooms and instructional offices, the principal buildings and facilities are:

**Botolph Building.** Civil Engineering Laboratories.

**Cabot Physical Education Center.** Facilities for physical education and athletics; gymnasium; cage; rifle range.

**Churchill Hall.** Graduate Division; Physics Laboratories; faculty and staff cafeteria.

**Dana Research Building.** Research facilities for Electrical Engineering and Physics.

**Dodge Library.** Library; Center for Programmed Instruction; Engineering drawing rooms; Language Laboratory.

**EII Student Center.** Student activities; chapel; auditorium; student cafeteria; bookstore; student lounges and meeting rooms.

**102 The Fenway.** Center for Reading Improvement; Stearns Center for Research; gymnasium.

**Forsyth Building.** Laboratories for Industrial Engineering, Mechanical Engineering, and Allied Medical Sciences; planetarium; University Infirmary and Health Services; Speech Pathology and Audiology Center.

**Greenleaf Building.** ROTC headquarters; research facilities.

**Hayden Hall.** Lincoln College; University College; Colleges of Business Administration, Education, Engineering, and Liberal Arts; Electrical Engineering Laboratories.

**Mugar Life Sciences Building.** College of Pharmacy; laboratories for Biology, Chemical Engineering, and Psychology.

**Richards Hall.** Administrative offices; laboratories for Chemistry and Mechanical Engineering; bookstore.

**Robinson Hall.** Boston-Bouvé College; College of Nursing; laboratories for Biology and Physical Therapy; radio and television facilities.

**United Realty Building.** Research facilities for Mechanical Engineering, Biology, Psychology, and Chemistry; Institute for Rehabilitation.

### SUBURBAN CAMPUS AT BURLINGTON

In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-arts programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

### HENDERSON HOUSE

At Henderson House in Weston, Massachusetts, Northeastern University operates one of the nation's finest off-campus centers for continuing education. Adults enroll in short-term courses, seminars, and special institutes at this conference center, located 12 miles from the main campus on Huntington Avenue, Boston.

### WARREN CENTER

A 65.22-acre tract in Ashland is being developed for use as a laboratory for instruction in physical education and recreation.

## THE UNIVERSITY LIBRARY

The Dodge Library houses the research collections for all University programs. Library collections are located in nine areas:

1. The General Collection in the book stacks as indicated by the classification number given in the upper left corner of the catalog card.
2. The Reference Collection in the Cabot Reading Room to the left of the Circulation Desk, which includes bibliographies, government documents, maps, company publications, the information file, association publications, and theses.
3. The Periodical Collection on the basement level occupying the Lower Reading Room and the first two back-stack levels.
4. The Reserve Book Collection adjacent to the periodical room on the basement level.
5. The Foreign Literature Collections in the Webster Reading Room to the right of the Circulation Desk.
6. The Audio-Facility Division consisting of sound recordings and magnetic tapes for instructional and individual use in the Richardson Room on the second floor.
7. The American and English Literature Collections in the new Literature Reading Room.
8. The Humanities Collection (Philosophy, Psychology, Religion) in Rooms 202 and 203D.
9. The Microtext Collection housed on the basement level adjacent to the periodical room. This collection includes 300,000 titles in microprint, microfilm, and microfiche forms.

The University Library System includes two libraries in the Division of Research. Physics-Electrical Engineering is housed in 325 Dana Research Center and Chemistry-Mathematics is housed on the fifth floor of the United Realty Building.

The Card Catalog is a union list of materials in the University Library and is located in the Webster Reading Room.

The Circulation Department has an IBM card file of all students attending the University. To borrow materials students should present university identification at the Circulation Desk. For extensive research, where it is not possible for the University Library to acquire materials, the inter-library loan system allows the acquisition of items from other collections throughout the country.

### Library Hours

#### BOSTON CAMPUS

Monday—Thursday 7:45 a.m.—10:00 p.m.

Friday 7:45 a.m.—7:30 p.m.

Saturday 8:30 a.m.—4:00 p.m.

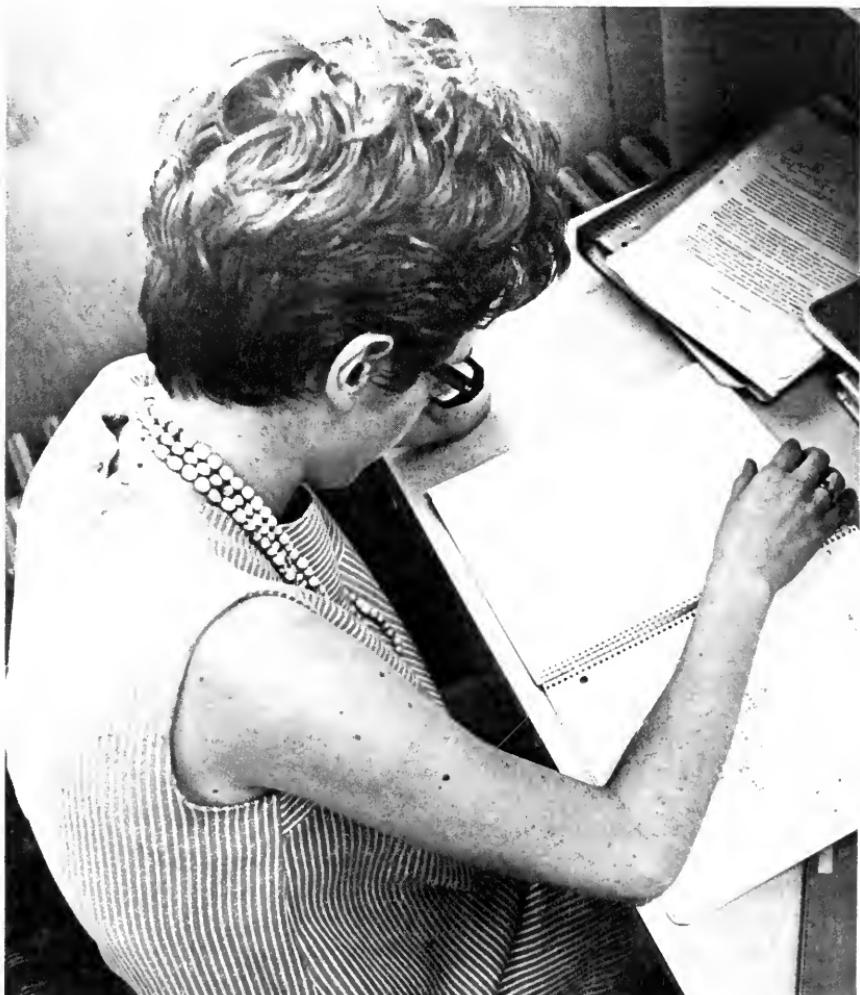
The reading rooms on the second floor are open until 1:00 a.m. Monday—Friday. The library is open Sundays and holidays from 1:00 to 10:00 p.m.

#### SUBURBAN CAMPUS—BURLINGTON

Monday—Thursday 8:30 a.m.—9:00 p.m.

Friday 8:30 a.m.—5:00 p.m.

Saturday 8:30 a.m.—1:00 p.m.



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# university college

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## The Programs

University College is committed to the education of mature, adult students who wish to live effectively in today's complex society. The programs in University College are specifically designed to satisfy the changing professional, cultural, and social needs and interests of adults.

Degree programs have been developed in 30 major fields of study in the areas of business administration, liberal arts, law enforcement, and health-related programs. Flexible curricula are offered on a part-time basis Monday through Saturday during day and evening hours convenient to adult students. Students may elect single courses or may enroll in full degree programs leading to the Associate in Science or the Bachelor of Science degree. Short-term seminars are also offered for credit. Classes are scheduled in locations which are accessible to the urban and the suburban community. Students may attend classes at the Huntington Avenue Campus, Boston, or the Suburban Campus, Burlington, Massachusetts, as well as other off-campus locations north and west of Boston.

University College programs are constantly evaluated and redesigned when necessary in order to keep pace with the changing needs and interests of its students and the community.

## The Faculty

Approximately 500 men and women comprise the part-time teaching staff of University College. Included are members of the full-time faculty of the Basic Colleges of Northeastern University and other educational institutions in New England, as well as outstanding New England business and professional leaders with backgrounds of training and experience in specialized areas. The faculty are selected because they are highly successful in their fields and are well qualified to provide sound methods of teaching for adults in an interesting, inspiring, and effective manner.

## The Student Body

The student body of University College represents diversified interests which properly recognized and utilized become one of the basic strengths in adult education. There are approximately 11,000 students in University College who range in age from 18 years to beyond retirement. While some students enroll in University College immediately after high school graduation, others may have graduated 25 years prior to enrollment in college-level courses.

University College students are men and women who have full-time commitments to their jobs, families, or other responsibilities. They may enroll in a single course or in a full degree curriculum, depending on whether their goal is job advancement, a new career, or personal enrichment.

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# academic policies

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## Admission

All applicants who satisfy the requirements for regular or special students as listed below are admitted as part-time students in University College. It is advisable for students to have an interview with an Admissions Counselor to help plan their academic program in University College. Applications are filled out when the student appears in person to register. Because of the diversity of the student body in terms of background, age, interests, needs, etc., there are no entrance examinations and college board examination scores are not required. In lieu of entrance examinations, students must maintain a C average in order to be admitted to degree candidacy.

## Regular Students

To be enrolled as a regular student, that is, to become a degree candidate, the applicant must have completed an approved secondary school course, or the equivalent 15 units\* of a high school diploma. Equivalency certificates are accepted. Regular students are those students who expect to follow a degree program.

## Special Students

Special students are those students who do not wish to enroll in a full degree program, but are interested in taking only one or more courses appropriate to their needs or interests. Credits for these courses may be transferred to a degree program if the student decides to pursue a degree at a later time.

## Procedure for Admission as a Degree Candidate

1. Upon completion of 36 quarter hours of credit, the student should officially petition for admission to the status of a degree candidate. Forms for this purpose are available in the University College Office, 219 Hayden Hall.

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\*A unit represents a year's work in any subject in any approved secondary school constituting approximately a quarter of a full year's work, or the equivalent. A four-year day high school course is regarded as representing at least 15 units of work, or 3 units in junior high school and 12 units in a three-year high school.

2. If a student has completed 40 quarter hours of credit in University College, he cannot register for any more courses unless he is enrolled as a degree candidate.
3. In order to be matriculated as a degree candidate, the student must have a high school diploma or its equivalent and must achieve a cumulative quality point average of 2.00 (an average grade of C) for all courses completed before filing the petition.
4. The Committee on Education may require a student to take one or more aptitude or interest tests if his credentials or academic record fail to give evidence of probable academic success. In this case the student will be notified in writing that arrangements for testing should be made by him with the University Counseling and Testing Center. A fee is charged for administering these tests.

### **Advanced Standing Credit**

Advanced standing credit in University College may be obtained in two ways:

#### *By Transfer of Credit from Another Institution*

Subject to approval by the Director of Admissions, credit may be granted for work completed in other approved schools, colleges, or universities. An applicant who wishes to receive credit by transfer should indicate his desire when he applies for admission. He should write to the Registrar of the institution previously attended and request that an official transcript be sent to the Director of Admissions in University College. The transcript indicates honorable dismissal, courses completed, credits and grades received. The transcript should be sent well in advance of the registration period. The applicant should inform the Director of Admissions of his major field of interest so that the transcript will be evaluated appropriately.

Students who have been dismissed from another institution for academic reasons must accompany their application with a statement from the dean or other appropriate official of their previous institution setting forth the reasons for dismissal or probationary status with recommendation for continued study. All applicants will be considered on their own merits.

#### *By Examination*

1. For Credit: No advanced standing credit is awarded except for work previously completed in courses comparable to those offered in University College or compatible with the objective of the student's curriculum. Credit may be disallowed for work previously completed due to the remoteness of the time of study; however, these applicants will be granted the privilege of taking an examination for credit.

**2. For Placement:** Applicants who, as a result of previous training and experience, may be considered to possess sufficient knowledge of a subject will be allowed the privilege of taking a special examination in particular courses.

The grade of B or better must be obtained in any examination taken for placement.

In all cases students admitted by transfer or advanced standing credit from any other institution must meet the requirements for matriculated status as set forth under the regulations applicable to regular students.

### **Residence Requirement**

Every candidate for the baccalaureate or associate degree must fulfill the residence requirement. The residence requirement is defined as the satisfactory completion in University College immediately preceding graduation of 44 consecutive quarter hours of work in course, with the further provision that at least 12 of the 44 quarter hours must be in the candidate's major field. All programs to meet the residency requirement must have the approval of the Dean. Students whose attendance in degree programs is interrupted for a period of one year or more will be reinstated into the program in effect at the time of their re-entry into University College.

In the case of students who for causes beyond their control move outside of the reasonable commuting area of the College, and who have completed 134 or more quarter hours of credit in course, the Committee on Education will entertain a petition to allow them the privilege of completing their degree requirements at some other approved college. Under no circumstances will a degree be awarded to any student who has completed less than 44 quarter hours of credit in courses in University College.

### **Quality Requirement for Graduation**

A cumulative quality point average of 2.00 (an average grade of C) is required for graduation. Advanced standing credits are not averaged in the cumulative score.

### **Graduation with Honor**

Candidates who have achieved distinctly superior attainment in their academic work will be graduated with honor. Upon special vote of the faculty a limited number of this group may be graduated with high honor or with highest honor. To be considered for graduation with honor, a student must have completed a minimum of 80 quarter hours of work at University College. Courses credited by advanced standing will be eliminated in determining honor graduates.

### **Attendance at Commencement**

All candidates for University College degrees are required to attend Commencement in the year of qualification. Degrees in absentia are awarded only to candidates excused for personal or immediate-family illness, military service, or employment obligations which are beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean. Each petition will be acted upon by the Dean.

### **Quality Points**

The requirement for graduation from University College is 174 quarter hours with attainment of a quality point average of 2.00. Although the credits allowed for acceptable work completed elsewhere by transfer students count toward fulfillment of quantitative graduation requirements, neither the credits nor the grades earned in such courses are included in quality point computations for graduation.

The method of figuring quality points is as follows: Each quarter hour credit of A grade is multiplied by 4, B grade by 3, C grade by 2, D grade by 1, and F grade by 0. The total number of quality points, divided by the total number of quarter hour credits completed, shall be the quality point average.

Students receiving an F grade in a required course must repeat the course in its entirety including term work, examinations, and attendance.

### **Quality Point Averages**

The Registrar's Office, 120 Hayden Hall, will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Director of Admissions of University College.

### **Canceled Classes**

University College reserves the right to cancel, postpone, or combine classes when necessary.

### **Registration**

Before attending classes, students must report to the registration area to register. All students must complete their registration properly before attending class.

No academic credit will be recorded for students not properly registered.

In order to insure academic success, students are strongly advised to adhere to course prerequisites.

**Change-of-Program Fee**

Students are urged to register early during the official registration period before the beginning of each quarter.

Any change of program after the close of the official registration period will be subject to a fee of \$5.00.

**Class Attendance and Preparation**

Students are expected to attend all exercises in the subjects they are studying unless excused in advance.

Absence from regularly scheduled exercises in any subject will seriously affect the standing of the student. Consecutive absences may cause the removal of the subject or subjects from the student's schedule.

Two hours of preparation are normally required for each hour spent in the classroom.

**Withdrawals**

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal. To withdraw from a course, the Registrar's Office must be notified by the student and the appropriate withdrawal form filled out.

**Change of Address**

Change of address and/or name should be reported immediately to the Registrar's Office, 120 Hayden Hall.

**Absence Because of Illness**

All students who are absent from school because of extended illness should inform the Registrar's Office, 120 Hayden Hall, by letter, message, or phone call.

**Examinations**

Term tests are scheduled in each quarter at the option of the instructor and are regarded as part of the term's course work. A final examination will be held at the end of each quarter in each course unless an announcement to the contrary is made.

**Homework Assignments**

Students are responsible for obtaining their homework assignments by contacting their instructor or another student in their class. Homework assignments are not available in the University College Office.

### **Missed Final Examinations**

A student does not automatically have the right to make up a missed final examination. Students must petition for this privilege. If the petition is granted, the student must pay a fee of \$5.00 for taking the special final examination. Petitions may be obtained from the Registrar's Office, 120 Hayden Hall, or in each off-campus Administration Office. Petitions for missed finals must be filed in accordance with the schedule listed below:

<b>final examination missed during:</b>	<b>file petition no later than:</b>	<b>make-up final examination during week of:</b>
Fall Quarter	Dec. 30, 1967	Jan. 22, 1968
Winter Quarter	March 30, 1968	April 22, 1968
Spring Quarter	June 29, 1968	July 22, 1968
Summer Quarter	Oct. 5, 1968	Oct. 28, 1968

Students will be notified by mail when and where to take the missed final examination. All examinations will be administered on the Boston Campus.

Students who do not take make-up final examinations as scheduled forfeit the make-up privilege.

### **Grades and Credit**

The following symbols are used in grading:

- A** — Outstanding
- B** — Good
- C** — Satisfactory
- D** — Poor
- F** — Failure
- I** — Incomplete

An official University College grade report will be mailed to each student legitimately enrolled in courses approximately three weeks after the quarter is completed. Grades will not be given over the telephone or at the Registrar's Office, 120 Hayden Hall.

### **Academic Probation**

Students whose scholarship in any given period is unsatisfactory may be dropped from the College or may be placed on probation.

### **Disciplinary Probation**

The Committee on Education has the authority to dismiss from the College or place on probation at any time or to strike from the list of candidates for the degree, any student deemed unworthy because of conduct or character.

# BOOK STORE



# **tuition and fees**

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Tuition and fees are refundable only as stated under "Refund of Tuition." Checks and drafts for all charges are to be drawn to the order of Northeastern University.

## **Initial Registration Fee**

The University initial registration fee of \$10.00 is to be paid at the time of first billing. This fee is nonrefundable.

## **Tuition**

Tuition for all credit courses offered at the Boston Campus is \$17.00 per quarter hour of credit. Charges for registration and tuition for special courses are at the rate and on the basis of payment specified for each course.

Tuition for all University College credit courses offered at the Suburban Campus of Northeastern University in Burlington is \$19.50 per quarter hour of credit. Tuition at all other off-campus locations is \$17.00 per quarter hour of credit.

Tuition for all credit courses is charged on the quarter basis and is payable at the beginning of each quarter.

Students are not permitted to attend class sessions or take any examination or test until they have paid their tuition fees or have made satisfactory arrangements for payment.

Students will not be advanced in class standing, or permitted to re-enroll in the University, nor will degrees be conferred until all financial obligations to the University have been met.

No certificate of honorable dismissal will be issued to any student who has not fully met his financial obligations to the University.

## **Tuition Budget Payment Plans**

Occasionally situations develop—usually beyond the control of the student—which make it difficult to meet the payments in the manner outlined above. Under such circumstances the student is advised to discuss his problem personally at the Bursar's Office, where one of the budget plans or a deferred payment agreement may be worked out. Such arrangements should be made before the end of the first week of the quarter or within one week of the date of registration if the student enters late. A charge of \$2.00 will be made. Failure to take immediate action will result in a late payment fee of \$5.00.

### **Tuition Underwritten by Employers**

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases where payment is to be made directly by the employer to the University, the student should furnish to the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

### **Veterans' Benefits**

Any veteran covered by Public Law 89-358 should report to Room 245R to fill out the proper enrollment forms.

### **Late Payment Fee**

Bills for tuition and fees are payable on or before Saturday of the week of issuance. A late payment fee of \$5.00 is charged for all students failing to comply unless special payment arrangements are approved by the Bursar's Office.

### **Refund of Tuition**

The Registrar's Office, 120 Hayden Hall, must be notified on an official form of a student's withdrawal. All refund adjustments are computed as of the date on which the official withdrawal slip is filed in the Registrar's Office.

### **Courses in Other Departments of the University**

University College students assigned to courses in other departments of the University are charged the tuition rates and other fees effective in the departments in which they are enrolled.

### **Student Center Fee**

All students in University College on the Huntington Avenue Campus are charged \$.75 each quarter for the services available in the Student Center.

### **Graduation Fee**

The University graduation fee, charged to those who are candidates for the baccalaureate or associate degree, is \$25.00 payable on or before May 1 of the year in which the student expects to graduate.

### **Transcripts**

Students may request transcripts of their grades at the Registrar's Office. There is no charge for the first transcript. After the initial transcript, there is a charge of \$1.00.

# **scholarships, awards and loan funds**

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The following scholarships and awards are available to students enrolled in University College.

## **Dean Russell Whitney Memorial Scholarship**

Alpha Chapter of the Pi Tau Kappa Fraternity sponsors an annual tuition scholarship in memory of former Dean Russell Whitney. The award is made available to the man in University College whose qualities of leadership and influence on his fellow students, strength of character, and record of scholarship and broad achievement mark him as outstanding. The award is made available to the student who has completed a minimum of 80 quarter hours. To be eligible for this scholarship, the student must pursue a normal schedule during the year in which the award is made.

## **Kappa Tau Phi Scholarship**

Kappa Tau Phi Sorority annually makes available two scholarship awards. They are granted to the women students in liberal arts and business programs, respectively, who rank highest in their class at the end of the upper-middler year. In the event the student is eligible for an award of greater monetary value, the award will be made to the next highest-ranking woman student. To be eligible for this scholarship, the student must be enrolled in a program of at least two evenings per week and must be a candidate for the Bachelor's degree. In determining this award, grades of all courses completed in prior years shall be considered.

## **Harry Olins Scholarship**

The Harry Olins Scholarship Fund was established as an expression of firm belief in University College students and "what they stand for." The fund, presented by Mrs. Harry Olins in recognition of her husband's long service on the faculty, makes available an annual tuition award to that student who in terms of scholastic achievement, character, and personal need best typifies the spirit of Northeastern University.

To be eligible for this award, the student must be a degree candidate and carry a full academic load during the school year.

## **Pilot Freight Carriers Scholarship**

Pilot Freight Carriers, Winston-Salem, N.C., awards \$500 annually to an advanced transportation student who has achieved high academic standing and who has paid his tuition expenses without prior aid. The award may be shared by more than one student. Potential recipients are designated by the Director of the Transportation Institute, and a final determination is made by the Dean of University College.

**University College Faculty Club Memorial Scholarship Awards**

The newly founded Faculty Club of University College, Northeastern University, offers two awards annually, primarily for excellence in studies, to Bachelor of Science degree candidates in University College who have carried, and are currently carrying, a minimum of 24 quarter hours (the equivalent of 16 semester hours) for the academic year.

These awards shall be known as University College Faculty Club Memorial Scholarship Awards in commemoration of the Club's deceased members.

**Traffic Club of New England Scholarship**

The Traffic Club of New England provides 12 basic and four advanced scholarships annually for persons employed in transportation and industry traffic departments. The scholarships are divided equally between industry and carrier applicants, and each award is applicable toward tuition, books, and incidental expenses involved in Transportation Management courses. The purpose of the plan is to afford a limited number of young men an opportunity to expand and improve their education by systematized study in courses in the field of transportation and traffic management. The scholarships are administered cooperatively with the Scholarship Committee of the Traffic Club of New England. Applications may be secured from and filed with the Secretary, The Traffic Club of New England, 294 Washington Street, Boston, Massachusetts 02108.

**Sigma Epsilon Rho Scholarship**

This scholarship is given to the highest-ranking student in University College at the end of his junior year.

**The Northeastern University Faculty Wives Scholarship**

Each year the Faculty Wives Club of Northeastern University offers a scholarship to a young woman of limited financial resources who has demonstrated a likelihood of succeeding in her chosen professional field.

**University Scholarships**

Northeastern University has for many years maintained a scholarship fund for deserving, qualified students. These scholarships are awarded on the basis of need, scholastic standing, and campus citizenship. Applicants must complete the same form used for the National Defense Student Loan Program and file it with the Office of Financial Aid one month prior to the start of the quarter. All applications will be considered for all scholarship and loan programs administered by the University unless an applicant specifies otherwise.

**National Defense Student Loan Program**

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need

of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one-half of the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$1,000. The total of loans made to a student for all years, including any made to him as a graduate student, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date on which the borrower ceases to carry, at an institution of higher education, at least one-half the normal full-time academic workload as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, the cancellation rate is 15 per cent for each complete year of service; and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and application forms are available through the University College Office or from the Office of Financial Aid. For full-time students, the deadline for application is August 1, and for half-time students, one month prior to the start of the quarter for which aid is requested.

### **Guaranteed Loan Program**

The major objective of this program is to make loan insurance available to any college student who wants to borrow. Under this program a student enrolled for at least one-half the normal academic work load may borrow from a bank or other financial institution. A graduate student may borrow as much as \$1,500 a year; an undergraduate, as much as \$1,000.

A student from a family with an adjusted income of less than \$15,000 a year pays no interest while he is in the University. Repayment of principal and interest begins when the student has ceased his course of study. At that time the Federal Government pays approximately one-half the interest and the student the remainder. A student from a family with an adjusted income higher than \$15,000 a year pays the entire interest on the loan, but he may borrow under the Guaranteed Loan Program at 6 per cent simple interest.

Students may obtain additional information and the necessary application forms from their local bank or other financial institution.

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# **student activities**

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Student activities for part-time students are planned, organized and operated by the student body with the assistance of the Assistant Director of Student Activities. The programs are designed to keep pace with the changing needs of adult students and to provide maximum opportunity for student participation. All part-time students in University College, Lincoln College, and the Graduate Schools are welcome to participate.

The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The Office of Student Activities is particularly interested in developing new clubs which will benefit students professionally and educationally. If students wish to start clubs related to their professions, this office will help them plan and organize clubs on the local and national level. The program is dedicated to assisting the adult student in the development of his fullest potential. The Student Activities Office is located in 254 Ell Student Center.

## **Purpose**

The purposes of evening student activities are:

To encourage and reward scholarship.

To provide opportunities for the development and pursuit of cultural interests and professional objectives.

To encourage the development of leadership activities and skills.

To enable the student to identify more closely with the University.

To include the family, as an important and vital motivating force, in the evening student's educational career.

## **Society for the Advancement of Management**

The Society for the Advancement of Management is the recognized national professional organization of managers in industry, commerce, government, and education. It has been dedicated to the advancement of management and managers since 1912, when the original Taylor Society was established. University chapters operate in 190 leading colleges and universities in the United States, Canada, Puerto Rico, and Hawaii.

The Northeastern University chapter is open to all adult students interested in furthering their growth and insight into the practice of the management profession.

The Northeastern University evening student chapter brings together business executives and students who are interested in the art and science of management. Meetings, conferences, and seminars provide an effective medium for the exchange and distribution of information on the problems, policies, and methods of management and industry.

### **Sigma Epsilon Rho Honor Fraternity**

Sigma Epsilon Rho is the honor fraternity of University College. Its purposes are:

To promote acquaintance and good fellowship among those men who have attained highest scholastic standing in the College.

To stimulate the student body to higher scholastic accomplishment through the bearing, influence, and work of these selected men.

To develop methods of mutual improvement and advancement among the members of this fraternity.

To support high moral, professional, and scholastic ideals.

Only honor graduates or seniors with honor standing at the end of the junior year are eligible for admission to the fraternity. Admission is by invitation after nomination by the fraternity.

An outstanding book is awarded each year by Sigma Epsilon Rho Fraternity to the highest-ranking student at the conclusion of the junior year. Students will receive the award only in the event that they enroll for the subsequent year.

### **Pi Tau Kappa Fraternity**

Pi Tau Kappa is a social fraternity open to all evening students. It is organized to further the interests of students in their education, to promote closer affiliation between the student and the University, and to promote the social welfare of the adult student.

### **Kappa Tau Phi Sorority**

Kappa Tau Phi Sorority is a social organization open to all evening women students. Its purpose is to promote fellowship among the women students so that they may become better acquainted and form a closer tie with the University. Monthly dinner meetings are held. Two scholarships are awarded annually to scholastically superior women students.

### **Placement Service**

Whenever students or graduates request the College to assist them in securing new opportunities for development or advancement, the College will endeavor to put them in touch with employers who may have asked the College to assist them in finding employees with the qualities and potential required. While the College cannot guarantee positions to either its undergraduates or graduates, it will do what it can to bring applicants and employers together to their possible mutual satisfaction. In the final analysis, placement depends largely on the applicant's ability to sell his services. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling positions at all levels.

No charge is made for placement service.

### Alumni Association

More than 32,000 alumni are members of the all-University Alumni Association which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 20 of the Forsyth Annex.

The official publication of the Alumni Association, *The Northeastern University ALUMNUS*, is published quarterly and sent free of charge to all alumni on record.

Through its Vice President for the Alumni Fund, the Association cooperates with the Office of University Development in raising funds from alumni for the Diamond Anniversary Development Program.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in each of the seven Basic Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of the undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for co-ordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 40 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization, and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the five major sports.

One of the most recent developments in alumni activities is the organization of seminars which are conducted by the Association in co-operation with the University's Center for Continuing Education. The seminars are designed particularly for alumni who have a special interest in current events and the field of adult education.

# **programs of study**

University College conducts part-time educational programs at the undergraduate level during day and evening hours. The programs are designed to meet the varying needs and interests of adult students who may enroll as (1) *Regular* students following degree programs or as (2) *Special* students taking single courses or special programs.

University College programs leading to the Bachelor of Science degree provide opportunities for cultural and professional development equivalent in quality and scope to those offered in the conventional four-year college enrolling full-time students. The Bachelor of Science degree requires 174 quarter hours of credit.

Programs leading to the Associate in Science degree provide students a background in fundamental areas in business administration, liberal arts, health-related programs, and law enforcement. The Associate degree requires 96 quarter hours of credit and is equivalent to the conventional two-year, or junior, college in scope and quality.

Degree curricula are offered in the following areas:

## **BUSINESS ADMINISTRATION**

<b>Major</b>	<b>Degree</b>	<b>Page</b>
Accounting	Bachelor of Science	44
	Associate in Science	46
Electronic Data Processing	Associate in Science	48
Finance	Bachelor of Science	50
	Associate in Science	52
Industrial Management	Bachelor of Science	54
	Associate in Science	56
Industrial Technology	Bachelor of Science	59
Insurance	Bachelor of Science	60
	Associate in Science	62
Management	Bachelor of Science	64
	Associate in Science	66
Management Information Systems	Bachelor of Science	68
Marketing	Bachelor of Science	70
	Associate in Science	72
Personnel and Industrial Relations	Bachelor of Science	74
	Associate in Science	76
Purchasing	Associate in Science	78
Real Estate	Associate in Science	80
Transportation Management	Associate in Science	82
Combined Program in Liberal Arts and Management	Bachelor of Science	84

**LIBERAL ARTS**

<b>Major</b>	<b>Degree</b>	<b>Page</b>
Economics	Bachelor of Science	89
English	Bachelor of Science	90
Fine Arts	Bachelor of Science	92
History	Bachelor of Science	94
Liberal Arts	Associate in Science	96
Political Science	Bachelor of Science	97
Psychology	Bachelor of Science	99
Sociology-Anthropology	Bachelor of Science	100

**LAW ENFORCEMENT**

<b>Major</b>	<b>Degree</b>	<b>Page</b>
Correctional Practices	Bachelor of Science	103
	Associate in Science	104
Law Enforcement	Bachelor of Science	105
	Associate in Science	106
Security	Bachelor of Science	107
	Associate in Science	108

**HEALTH-RELATED PROGRAMS**

<b>Major</b>	<b>Degree</b>	<b>Page</b>
<b>Forsyth School—Northeastern University Affiliated Program</b>		
Program for Dental Hygienists	Bachelor of Science	109
<b>Health Care Administration</b>		
Management in Health Agencies and Institutions	Bachelor of Science	111
Medical Records Science	Bachelor of Science	114
	Certificate	116
Nursing Home Administration	Selected courses—no degree	113
<b>Lincoln College—University College Affiliated Programs</b>		
Chemical-Biological Technology	Bachelor of Science	118
Cytotechnology	Bachelor of Science	119
Medical Technology	Bachelor of Science	120

Course descriptions are listed in numerical order by department beginning on page 121.

# **business administration**

## **Aims**

Business Administration programs of study are offered to meet the needs of adult men and women who wish to acquire professional competence in their chosen field of business.

The Bachelor of Science degree is offered in the areas of Accounting, Marketing, Finance, Insurance, Management, Personnel and Industrial Relations, and Industrial Management. The Associate in Science degree is offered in Accounting, Marketing, Finance, Insurance, Management, Personnel and Industrial Relations, Industrial Management, Electronic Data Processing, Real Estate, and Transportation.

The degree programs in Business Administration are designed to build for the student both a breadth of perspective and a degree of specialization. The former is obtained through a strong and well-balanced sequence of Liberal Arts courses which emphasize our fundamental economic laws and the social and cultural foundations of American Society. The latter is obtained by a study of the basic business courses in addition to a concentrated study in the major business area selected by the student.

## **Requirements**

### **The Bachelor of Science Degree**

In general, the Bachelor of Science degree in Business Administration requires successful completion of the following areas of study:

	quarter hours
Basic Courses	36
Additional Courses	24
Core Courses	54
Major Concentration Courses and Electives	<u>60</u>
Total Quarter Hours required for Bachelor of Science Degree	<u>174</u>

### **The Associate in Science Degree**

To qualify for the Associate in Science degree in Business Administration, the following areas must be successfully completed:

	quarter hours
Basic Courses	36
Core Courses	30
Major Concentration Courses and Electives	<u>30</u>
Total Quarter Hours required for Associate in Science Degree	<u>96</u>

Detailed information about these programs together with a recommended sequence for completing them appears on the following pages.

**ACCOUNTING****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
30.504,	30.505,	30.506	English I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				<b>36</b>

**Additional Courses—required**

16.501,	16.502,	16.503	Natural Science I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
			Art, Music, or Theatre Arts	6
				<b>24</b>

**Core Courses—required**

39.511,	39.512,	39.513	Statistics I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6
44.507,	44.508,	44.509	Corporate Finance I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
		45.510	Labor-Management Relations	2
	45.511,	45.512	Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				<b>54</b>

**Major Concentration Courses—required**

41.504,	41.505,	41.506	Accounting—Intermediate I, II, III	6
41.507,	41.508,	41.509	Accounting—Cost I, II, III	6
41.510,	41.511,	41.512	Accounting—Advanced I, II, III	6
41.513,	41.514,	41.515	Accounting—Specialized Problems I, II, III	6
41.516,	41.517,	41.518	Auditing I, II, III	6
41.519,	41.520,	41.521	Federal Income Taxes I, II, III	6
41.522,	41.523,	41.524	Seminar in Contemporary Accounting Problems I, II, III	6
				<b>42</b>

**Electives**Total Credits **18****Total Credits**

Students following a degree program should refer to the suggested course sequence on the opposite page.

**ACCOUNTING**

**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
<b>2nd Year</b>	Econ. I Cap. Inst.— Risk Mgmt. I Math. I Inter. Acctg. I	Econ. II Cap. Inst.— Risk Mgmt. II Math. II Inter. Acctg. II	Econ. III Cap. Inst.— Risk Mgmt. III Math. III Inter. Acctg. III
<b>3rd Year</b>	Lit. I Law I Intro. Mktg. I Adv. Acctg. I	Lit. II Law II Intro. Mktg. II Adv. Acctg. II	Lit. III Law III Intro. Mktg. III Adv. Acctg. III
<b>4th Year</b>	Nat. Sci. I Stat. I E. D. P. I Acctg. Spec. Prob. I	Nat. Sci. II Stat. II E. D. P. II Acctg. Spec. Prob. II	Nat. Sci. III Stat. III E. D. P. III Acctg. Spec. Prob. III
<b>5th Year</b>	West. Civ. I Sociology I Corp. Fin. I Cost Acctg. I	West. Civ. II Sociology II Corp. Fin. II Cost Acctg. II	West. Civ. III Sociology III Corp. Fin. III Cost. Acctg. III
<b>6th Year</b>	Phil. I Psych. I Lab.-Mgmt. Rel. Audit. I	Phil. II Psych. II Human Rel. I Audit. II	Phil. III Psych. III Human Rel. II Audit. III
<b>7th Year</b>	Art, Music Fed. Inc. Tax I Elective Elective	Art, Music Fed. Inc. Tax II Elective Elective	Art, Music Fed. Inc. Tax III Elective Elective
<b>8th Year</b>	Seminar I Elective	Seminar II Elective	Seminar III Elective

**ACCOUNTING****Associate in Science Degree**

quarter hours

**Basic Courses—required**

10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

**36****Core Courses—required**

39.511, 39.512, 39.513	Statistics I, II, III	6
41.501, 41.502, 41.503	Accounting Principles I, II, III	6
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III	6
45.501, 45.502, 45.503	Management and Organization I, II, III	6
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6

**30****Major Concentration Courses—required**

41.504, 41.505, 41.506	Accounting—Intermediate I, II, III	6
41.507, 41.508, 41.509	Accounting—Cost I, II, III	6
41.510, 41.511, 41.512	Accounting—Advanced I, II, III	6
41.516, 41.517, 41.518	Auditing I, II, III	6
41.519, 41.520, 41.521	Federal Income Taxes I, II, III	6

**30****Total Credits****96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

**ACCOUNTING**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	Psych. I	Psych. II	Psych. III
	Cap. Inst.—	Cap. Inst.—	Cap. Inst.—
	Risk Mgmt. I	Risk Mgmt. II	Risk Mgmt. III
	Inter. Acctg. I	Inter. Acctg. II	Inter. Acctg. III
<b>3rd Year</b>	E. D. P. I	E. D. P. II	E. D. P. III
	Stat. I	Stat. II	Stat. III
	Cost Acctg. I	Cost. Acctg. II	Cost Acctg. III
	Adv. Acctg. I	Adv. Acctg. II	Adv. Acctg. III
<b>4th Year</b>	Lit. I	Lit. II	Lit. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Audit. I	Audit. II	Audit. III
	Fed. Inc. Tax I	Fed. Inc. Tax II	Fed. Inc. Tax III



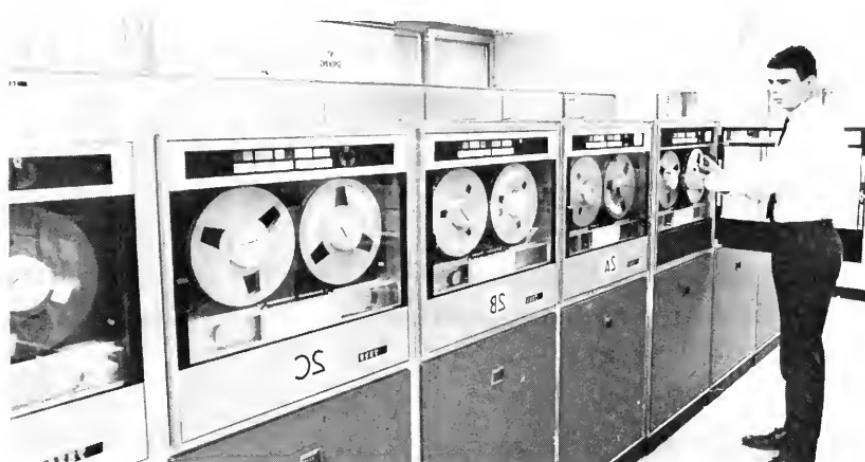
<b>ELECTRONIC DATA PROCESSING</b>			<b>Associate in Science Degree</b>
			<b>quarter hours</b>
<b>Basic Courses—required</b>			
10.501, 10.502, 10.503	Mathematics I, II, III	6	
19.501, 19.502, 19.503	Psychology I, II, III	6	
23.501, 23.502, 23.503	Western Civilization I, II, III	6	
30.504, 30.505, 30.506	English I, II, III	6	
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6	
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6	<b>36</b>
<b>Core Courses—required</b>			
39.511, 39.512, 39.513	Statistics I, II, III	6	
41.501, 41.502, 41.503	Accounting Principles I, II, III	6	
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III	6	
45.501, 45.502, 45.503	Management and Organization I, II, III	6	
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6	<b>30</b>
<b>Major Concentration Courses—required</b>			
10.504, 10.505, 10.506	Mathematics for Scientific Business Management I, II, III	6	
	45.573 Basic Computer Programming	2	
45.574, 45.575	Computer Programming for Business I, II	4	
	45.576 COmmon Business Oriented Languages	2	
	45.577 Data Systems Administration	2	
45.578, 45.579	Business Data Processing Applications I, II	4	
45.586, 45.587, 45.588	Systems Design and Techniques I, II, III	2	
	45.630 Introduction to Operations Research	2	
	45.631 Operations Research Applications I	2	<b>30</b>
<b>Total Credits</b>			<b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**ELECTRONIC DATA PROCESSING**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	E. D. P. I	E. D. P. II	E. D. P. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
<b>2nd Year</b>	Math. I	Math. II	Math. III
	Econ. I	Econ. II	Econ. III
	Acctg. I	Acctg. II	Acctg. III
<b>3rd Year</b>	Math.-Sci.	Math.-Sci.	Math.-Sci.
	Bus. Mgmt. I	Bus. Mgmt. II	Bus. Mgmt. III
	Basic Comp. Prog.	Comp. Prog. Bus. I	Comp. Prog. Bus. II
<b>4th Year</b>	Cap. Inst.— Risk Mgmt. I	Cap. Inst.— Risk Mgmt. II	Cap. Inst.— Risk Mgmt. III
	Psych. I	Psych. II	Psych. III
	Sys. Des. Tech. I	Sys. Des. Tech. II	Sys. Des. Tech. III
	Stat. I	Stat. II	Stat. III
	Lit. I	Lit. II	Lit. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Bus. Data	Bus. Data	COBOL
	Proc. Appl. I	Proc. Appl. II	
	Data Sys. Adm.	Intro. Op. Res.	Op. Res. Applications



**FINANCE****Bachelor of Science Degree**

			quarter hours
<b>Basic Courses—required</b>			
10.501, 10.502, 10.503	Mathematics I, II, III		6
19.501, 19.502, 19.503	Psychology I, II, III		6
23.501, 23.502, 23.503	Western Civilization I, II, III		6
30.504, 30.505, 30.506	English I, II, III		6
30.507, 30.508, 30.509	Introduction to Literature I, II, III		6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6	<b>36</b>
		<u>—</u>	
<b>Additional Courses—required</b>			
16.501, 16.502, 16.503	Natural Science I, II, III		6
21.501, 21.502, 21.503	Sociology I, II, III		6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III		6
	Art, Music, or Theatre Arts	6	<b>24</b>
		<u>—</u>	
<b>Core Courses—required</b>			
39.511, 39.512, 39.513	Statistics I, II, III		6
41.501, 41.502, 41.503	Accounting Principles I, II, III		6
43.501, 43.502, 43.503	Introduction to Marketing I, II, III		6
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III		6
44.507, 44.508, 44.509	Corporate Finance I, II, III		6
45.501, 45.502, 45.503	Management and Organization I, II, III		6
	45.510 Labor-Management Relations		2
	45.511, 45.512 Human Relations in Personnel I, II		4
45.541, 45.542, 45.543	Law I, II, III		6
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6	<b>54</b>
		<u>—</u>	
<b>Major Concentration Courses—required</b>			
39.517, 39.518	Money and Banking I, II		4
	39.519 Public Finance		2
41.504, 41.505	Accounting—Intermediate I, II		4
	41.529 Analysis of Financial Statements		2
44.511, 44.512	Life Insurance I, II		4
	44.513 Estate Planning		2
44.514, 44.515, 44.516	Property and Casualty Insurance I, II, III		6
44.517, 44.518, 44.519	Investments I, II, III		6
44.521, 44.522, 44.523	Credit Management I, II, III		6
44.531, 44.532	Seminar in Finance I, II		4
	45.547 Law of Finance		2
47.501, 47.502	Real Estate Fundamentals I, II	4	<b>46</b>
		<u>—</u>	
<b>Electives</b>			<b>14</b>
			<u>—</u>
	<b>Total Credits</b>		<b>174</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

	Quarter 1	Quarter 2	Quarter 3
1st Year	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
2nd Year	Econ. I Cap. Inst.— Risk Mgmt. I Math. I Inter. Acctg. I	Econ. II Cap. Inst.— Risk Mgmt. II Math. II Inter. Acctg. II	Econ. III Cap. Inst.— Risk Mgmt. III Math. III Anal. Fin. State.
3rd Year	Lit. I Law I Intro. Mktg. I Prop.-Cas. Ins. I	Lit. II Law II Intro. Mktg. II Prop.-Cas. Ins. II	Lit. III Law III Intro. Mktg. III Prop.-Cas. Ins. III
4th Year	Nat. Sci. I Stat. I E. D. P. I Life Ins. I	Nat. Sci. II Stat. II E. D. P. II Life Ins. II	Nat. Sci. III Stat. III E. D. P. III Estate Plan.
5th Year	West. Civ. I Soc. I Corp. Fin. I R. E. Fund. I	West. Civ. II Soc. II Corp. Fin. II R. E. Fund. II	West. Civ. III Soc. III Corp. Fin. III Elective
6th Year	Phil. I Psych. I Lab.-Mgmt. Rel. Credit Mgmt. I	Phil. II Psych. II Human Rel. I Credit Mgmt. II	Phil. III Psych. III Human Rel. II Credit Mgmt. III
7th Year	Art, Music Invest. I Money & Bnkg. I Elective	Art, Music Invest. II Money & Bnkg. II Elective	Art, Music Invest. III Pub. Fin. Elective
8th Year	Law of Fin. Elective	Sem.-Fin. I Elective	Sem.-Fin. II Elective

<b>FINANCE</b>	<b>Associate in Science Degree</b>	
		<b>quarter hours</b>
<b>Basic Courses—required</b>		
10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6 <b>36</b> —
<b>Core Courses—required</b>		
39.511, 39.512, 39.513	Statistics I, II, III	6
41.501, 41.502, 41.503	Accounting Principles I, II, III	6
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III	6
45.501, 45.502, 45.503	Management and Organization I, II, III	6
45.541, 45.542, 45.543	Law I, II, III	6 <b>30</b> —
<b>Major Concentration Courses—required</b>		
41.504, 41.505	Accounting—Intermediate I, II	4
41.529	Analysis of Financial Statements	2
44.507, 44.508, 44.509	Corporate Finance I, II, III	6
44.511, 44.512	Life Insurance I, II	4
44.513	Estate Planning	2
44.517, 44.518, 44.519	Investments I, II, III	6
44.521, 44.522, 44.523	Credit Management I, II, III	6 <b>30</b> —
<b>Total Credits</b>		
		<b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**FINANCE**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
<b>2nd Year</b>	Econ. I Psych. I Cap. Inst.— Risk Mgmt. I Inter. Acctg. I	Econ. II Psych. II Cap. Inst.— Risk Mgmt. II Inter. Acctg. II	Econ. III Psych. III Cap. Inst.— Risk Mgmt. III Anal. Fin. State.
<b>3rd Year</b>	Law I Stat. I Corp. Fin. I Life Ins. I	Law II Stat. II Corp. Fin. II Life Ins. II	Law III Stat. III Corp. Fin. III Estate Plan.
<b>4th Year</b>	Lit. I West. Civ. I Invest. I Credit Mgmt. I	Lit. II West. Civ. II Invest. II Credit Mgmt. II	Lit. III West. Civ. III Invest. III Credit Mgmt. III



**INDUSTRIAL MANAGEMENT****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		36

**Additional Courses—required**

16.501, 16.502, 16.503	Natural Science I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
	Art, Music, or Theatre Arts	6
		24

**Core Courses—required**

39.511, 39.512, 39.513	Statistics I, II, III	6
41.501, 41.502, 41.503	Accounting Principles I, II, III	6
43.501, 43.502, 43.503	Introduction to Marketing I, II, III	6
	45.510 Labor-Management Relations	2
	45.511, 45.512 Human Relations in Personnel I, II	4
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III	6
44.507, 44.508, 44.509	Corporate Finance I, II, III	6
45.501, 45.502, 45.503	Management and Organization I, II, III	6
45.541, 45.542, 45.543	Law I, II, III	6
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6
		54

**Major Concentration Courses—required**

45.506, 45.507, 45.508	Industrial Management I, II, III	6
	45.509 Production Processes	2
	45.516 Material Processes	2
45.519, 45.520	Work Simplification I, II	4
	45.522 Job Evaluation	2
	45.526 Plant Layout	2
45.528, 45.529	Work Measurement I, II	4
	45.530 Development of Standard Data	2
45.531, 45.532	Material Handling I, II	4
	45.536 Gauging and Measurement for Inspection	2
	45.537 Purchasing I	2
	45.544 Manufacturing Processes	2
45.561, 45.562	Statistical Quality Control I, II	4
45.595, 45.596, 45.597	Manufacturing Seminar I, II, III	6
	45.615 Work Sampling	2
45.620, 45.621	Industrial Safety I, II	4
45.627, 45.628, 45.629	Value Analysis and Planning I, II, III	6
		56

**Electives**

4

**Total Credits**

174

Students following a degree program should refer to the suggested course sequence on the opposite page.

**INDUSTRIAL MANAGEMENT**
**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
<b>2nd Year</b>	Econ. I Cap. Inst.— Risk Mgmt. I Ind. Mgmt. I Prod. Proc.	Econ. II Cap. Inst.— Risk Mgmt. II Ind. Mgmt. II Mat'l Proc.	Econ. III Cap. Inst.— Risk Mgmt. III Ind. Mgmt. III Mfg. Processes
<b>3rd Year</b>	Law I Math. I Intro. Mktg. I Work Simp. I	Law II Math. II Intro. Mktg. II Work Simp. II	Law III Math. III Intro. Mktg. III Work Sampling
<b>4th Year</b>	Psych. I Stat. I E. D. P. I Work Meas. I	Psych. II Stat. II E. D. P. II Work Meas. II	Psych. III Stat. III E. D. P. III Devel. of Std. Data
<b>5th Year</b>	West. Civ. I Lit. I Corp. Fin. I Gaug. & Meas.	West. Civ. II Lit. II Corp. Fin. II Stat. Qual. Cont. I	West. Civ. III Lit. III Corp. Fin. III Stat. Qual. Cont. II
<b>6th Year</b>	Nat. Sci. I Phil. I Mat'l Hand. I Art, Music	Nat. Sci. II Phil. II Mat'l Hand. II Art, Music	Nat. Sci. III Phil. III Plant Layout Art, Music
<b>7th Year</b>	Soc. I Lab.-Mgmt. Rel. Ind. Safety I	Soc. II Human Rel. I Ind. Safety II	Soc. III Human Rel. II Job. Eval.
<b>8th Year</b>	Mfg. Sem. I Purchasing I Value A. & P. I	Mfg. Sem. II Elective Value A. & P. II	Mfg. Sem. III Elective Value A. & P. III

**INDUSTRIAL MANAGEMENT****Associate in Science Degree**

				quarter hours
<b>Basic Courses—required</b>				
10.501,	10.502,	10.503	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
30.504,	30.505,	30.506	English I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				<b>36</b>
<b>Core Courses—required</b>				
39.511,	39.512,	39.513	Statistics I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				<b>24</b>
<b>Major Concentration Courses—required</b>				
45.506,	45.507,	45.508	Industrial Management I, II, III	6
		45.509	Production Processes	2
		45.510	Labor Management Relations	2
		45.516	Material Processes	2
45.519,	45.520	45.520	Work Simplification I, II	4
		45.522	Job Evaluation	2
45.528,	45.529	45.529	Work Measurement I, II	4
		45.536	Gauging and Measurement for Inspection	2
		45.537	Purchasing I	2
45.561,	45.562	45.562	Statistical Quality Control I, II	4
45.627,	45.628,	45.629	Value Analysis & Planning I, II, III	6
				<b>36</b>
<b>Total Credits</b>				<b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**INDUSTRIAL MANAGEMENT**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	Psych. I	Psych. II	Psych. III
	Ind. Mgmt. I	Ind. Mgmt. II	Ind. Mgmt. III
	Prod. Proc.	Mat'l Proc.	Purch. I
<b>3rd Year</b>	E. D. P. I	E. D. P. II	E. D. P. III
	Stat. I	Stat. II	Stat. III
	Work Simp. I	Work Simp. II	Lab. Mgt. Rel.
	Value A. & P. I	Value A. & P. II	Value A. & P. III
<b>4th Year</b>	Lit. I	Lit. II	Lit. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Work Meas. I	Work Meas. II	Job. Eval.
	Gaug. & Meas.	Stat. Qual. Cont. I	Stat. Qual. Cont. II



**INDUSTRIAL TECHNOLOGY****Bachelor of Science Degree**

Industrial Technology is concerned with the application of scientific methods to problems in the field of production management involving the effective use of men, materials, machinery, and money.

The Industrial Technology curriculum combines fundamental courses in one of several areas of engineering technology with an integrated program in management, the humanities, and the social sciences to provide background for those who aspire to positions of managerial responsibility where technical knowledge is required.

Upon graduation, the industrial technologist may find his way into such factory staff departments as methods engineering, production planning and control, wage administration, quality control, and time study. Additional opportunities are in cost accounting, statistical analysis, sales engineering, and safety engineering.

The curriculum is offered by University College in conjunction with Lincoln College. Graduates of Lincoln College or other technical schools who have been awarded the Associate degree may be granted up to 96 hours' credit toward the Bachelor of Science degree. The technology requirements may also be earned by satisfactory completion of equivalent technology courses in an accredited engineering college or technical institute.

The total requirements for the degree are 174 quarter hours, distributed as follows:

		quarter hours
<b>Engineering or Science Technology Courses</b>		<b>96</b>
<b>Liberal Content—required</b>		
19.501, 19.502, 19.503	Psychology I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		<b>36</b>
<b>Management Courses—required</b>		
	39.510	Statistics for Quality Control
41.501, 41.502, 41.503	Accounting Principles I, II, III	2
45.501, 45.502, 45.503	Management and Organization I, II, III	6
	45.510	Labor-Management Relations
45.541, 45.542, 45.543	Law I, II, III	2
45.561, 45.562	Statistical Quality Control I, II	6
	45.563	Management of Quality Control
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	2
		<b>34</b>
<b>Electives</b>		<b>—</b>
		<b>8</b>
	<b>Total Credits</b>	<b>174</b>

**INSURANCE****Bachelor of Science Degree**

				quarter hours
<b>Basic Courses—required</b>				
10.501,	10.502,	10.503	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
30.504,	30.505,	30.506	English I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				<b>36</b>
<b>Additional Courses—required</b>				
16.501,	16.502,	16.503	Natural Science I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
			Art, Music, or Theatre Arts	6
				<b>24</b>
<b>Core Courses—required</b>				
39.511,	39.512,	39.513	Statistics I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6
44.507,	44.508,	44.509	Corporate Finance I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
		45.510	Labor-Management Relations	2
	45.511,	45.512	Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				<b>54</b>
<b>Major Concentration Courses—required</b>				
39.517,	39.518		Money and Banking I, II	4
	39.519		Public Finance	2
44.511,	44.512		Life Insurance I, II	4
	44.513		Estate Planning	2
44.514,	44.515,	44.516	Property and Casualty Insurance I, II, III	6
		44.520	Life Insurance Problems	2
44.521,	44.522,	44.523	Credit Management I, II, III	6
		44.524	Property and Casualty Insurance Problems	2
44.525,	44.526		Health and Social Insurance I, II	4
	44.527		Business and Group Insurance and Pensions	2
	44.528		Insurance for Management	2
	45.550		Law of Insurance	2
47.501,	47.502		Real Estate Fundamentals I, II	4
				<b>42</b>
<b>Electives</b>				<b>18</b>
<b>Total Credits</b>				<b>174</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**INSURANCE**

**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	E. D. P. I	E. D. P. II	E. D. P. III
	Math. I	Math. II	Math. III
	Cap. Inst.— Risk Mgmt. I	Cap. Inst.— Risk Mgmt. II	Cap. Inst.— Risk Mgmt. III
<b>3rd Year</b>	Lit. I	Lit. II	Lit. III
	Law I	Law II	Law III
	Mktg. I	Mktg. II	Mktg. III
	Life Ins. I	Life Ins. II	Estate Plng.
<b>4th Year</b>	Nat. Sci. I	Nat. Sci. II	Nat. Sci. III
	Stat. I	Stat. II	Stat. III
	Prop.-Cas. Ins. I	Prop.-Cas. Ins. II	Prop.-Cas. Ins. III
	R. E. Fund. I	R. E. Fund. II	Elective
<b>5th Year</b>	West. Civ. I	West. Civ. II	West. Civ. III
	Soc. I	Soc. II	Soc. III
	Corp. Fin. I	Corp. Fin. II	Corp. Fin. III
	Hlth.-Soc. Ins. I	Hlth.Soc. Ins. II	Elective
<b>6th Year</b>	Phil. I	Phil. II	Phil. III
	Psych. I	Psych. II	Psych. III
	Lab.-Mgmt. Rel.	Human Rel. I	Human Rel. II
	Credit Mgmt. I	Credit Mgmt. II	Credit Mgmt. III
<b>7th Year</b>	Art, Music	Art, Music	Art, Music
	Money & Bnkg. I	Money & Bnkg. II	Pub. Fin.
	Bus.-Grp. Ins. Pen.	Ins. for Mgt.	Elective
<b>8th Year</b>	Insurance Law	Prop.-Cas. Ins. Prob.	Life Ins. Prob.
	Elective	Elective	Elective
	Elective	Elective	Elective

<b>INSURANCE</b>	<b>Associate in Science Degree</b>	
		<b>quarter hours</b>
<b>Basic Courses—required</b>		
10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6 <b>36</b> —
<b>Core Courses—required</b>		
39.511, 39.512, 39.513	Statistics I, II, III	6
41.501, 41.502, 41.503	Accounting Principles I, II, III	6
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III	6
45.501, 45.502, 45.503	Management and Organization I, II, III	6
45.541, 45.542, 45.543	Law I, II, III	6 <b>30</b> —
<b>Major Concentration Courses—required</b>		
44.507, 44.508, 44.509	Corporate Finance I, II, III	6
44.511, 44.512	Life Insurance I, II	4
44.513	Estate Planning	2
44.514, 44.515,	Property and Casualty Insurance I, II, III	6
44.520	Life Insurance Problems } or 44.524 Property and Casualty      } Insurance Problems                  } 2	
44.525, 44.526	Health and Social Insurance I, II	4
44.527	Business and Group Insurance and Pensions	2
44.528	Insurance for Management	2
45.550	Law of Insurance	2 <b>30</b> — <b>96</b>
<b>Total Credits</b>		<b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**INSURANCE**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	Psych. I	Psych. II	Psych. III
	Cap. Inst.—	Cap. Inst.—	Cap. Inst.—
	Risk Mgmt. I	Risk Mgmt. II	Risk Mgmt. III
<b>3rd Year</b>	Prop.-Cas. Ins. I	Prop.-Cas. Ins. II	Prop.-Cas. Ins. III
	Law I	Law II	Law III
	Stat. I	Stat. II	Stat. III
	Life Ins. I	Life Ins. II	Estate Plan.
<b>4th Year</b>	Corp. Fin. I	Corp. Fin. II	Corp. Fin. III
	Lit. I	Lit. II	Lit. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Hlth.-Soc. Ins. I	Hlth.-Soc. Ins. II	Elective Problems Course*
	Ins. Law	Bus.-Grp. Ins.-Pen.	Ins. for Mgt.

\*Depending on the student's area of concentration, either the Life Insurance Problems (44.520) or Property and Casualty Insurance Problems (44.524) may be elected at this point.

**MANAGEMENT****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
30.504,	30.505,	30.506	English I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				<b>36</b>
				<b>—</b>

**Additional Courses—required**

16.501,	16.502,	16.503	Natural Science I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
			Art, Music, or Theatre Arts	6
				<b>24</b>
				<b>—</b>

**Core Courses—required**

39.511,	39.512,	39.513	Statistics I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6
44.507,	44.508,	44.509	Corporate Finance I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
		45.510	Labor-Management Relations	2
	45.511,	45.512	Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				<b>54</b>
				<b>—</b>

**Major Concentration Courses—required**

29.501,	29.502,	29.503	Effective Speaking I, II, III	6
30.511,	30.512,	30.513	Business Writing and Reports I, II, III	6
	39.531,	39.532	Business Cycles I, II	4
		39.533	Business Planning and Research	2
41.533,	41.534,	41.535	Accounting for Management Decisions I, II, III	6
43.507,	43.508,	43.509	Sales Force Management I, II, III	6
45.506,	45.507,	45.508	Industrial Management I, II, III	6
45.523,	45.524,	45.525	Management Seminar I, II, III	6
				<b>42</b>
				<b>—</b>

**Electives****Total Credits****18****174**

Students following a degree program should refer to the suggested course sequence on the opposite page.

**MANAGEMENT**
**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
<b>2nd Year</b>	Econ. I E. D. P. I Math. I Ind. Mgmt. I	Econ. II E. D. P. II Math. II Ind. Mgmt. II	Econ. III E. D. P. III Math. III Ind. Mgmt. III
<b>3rd Year</b>	Lit. I Law I Mktg. I Acctg. Mgmt. Dec. I	Lit. II Law II Mktg. II Acctg. Mgmt. Dec. II	Lit. III Law III Mktg. III Acctg. Mgmt. Dec. III
<b>4th Year</b>	Nat. Sci. I Stat. I Cap. Inst.— Risk Mgmt. I Eff. Spkg. I	Nat. Sci. II Stat. II Cap. Inst.— Risk Mgmt. II Eff. Spkg. II	Nat. Sci. III Stat. III Cap. Inst.— Risk Mgmt. III Eff. Spkg. III
<b>5th Year</b>	West. Civ. I Soc. I Corp. Fin. I Lab.-Mgmt. Rel.	West. Civ. II Soc. II Corp. Fin. II Human Rel. I	West. Civ. III Soc. III Corp. Fin. III Human Rel. II
<b>6th Year</b>	Phil. I Psych. I Sales Force Mgmt. I Bus. Writ. & Rep. I	Phil. II Psych. II Sales Force Mgmt. II Bus. Writ. & Rep. II	Phil. III Psych. III Sales Force Mgmt. III Bus. Writ. & Rep. III
<b>7th Year</b>	Art, Music Bus. Cycles I Elective	Art, Music Bus. Cycles II Elective	Art, Music Bus. Plan. & Res. Elective
<b>8th Year</b>	Mgmt. Sem. I Elective Elective	Mgmt. Sem. II Elective Elective	Mgmt. Sem. III Elective Elective

<b>MANAGEMENT</b>	<b>Associate in Science Degree</b>	
	quarter hours	
<b>Basic Courses—required</b>		
10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		<b>36</b>
<b>Core Courses—required</b>		
39.511, 39.512, 39.513	Statistics I, II, III	6
41.501, 41.502, 41.503	Accounting Principles I, II, III	6
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III	6
45.501, 45.502, 45.503	Management and Organization I, II, III	6
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6
		<b>30</b>
<b>Major Concentration Courses—required</b>		
41.533, 41.534, 41.535	Accounting for Management Decisions I, II, III	6
44.507, 44.508, 44.509	Corporate Finance I, II, III	6
45.506, 45.507, 45.508	Industrial Management I, II, III	6
	45.510 Labor-Management Relations	2
	45.511, 45.512 Human Relations in Personnel I, II	4
45.541, 45.542, 45.543	Law I, II, III	6
		<b>1</b>
<b>Total Credits</b>		<b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**MANAGEMENT**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	Psych. I	Psych. II	Psych. III
	Cap. Inst.—	Cap. Inst.—	Cap. Inst.—
	Risk Mgmt. I	Risk Mgmt. II	Risk Mgmt. III
<b>3rd Year</b>	Acctg. Mgmt. Dec. I	Acctg. Mgmt. Dec. II	Acctg. Mgmt. Dec. III
	E. D. P. I	E. D. P. II	E. D. P. III
	Stat. I	Stat. II	Stat. III
	Corp. Fin. I	Corp. Fin. II	Corp. Fin. III
<b>4th Year</b>	Ind. Mgmt. I	Ind. Mgmt. II	Ind. Mgmt. III
	Lit. I	Lit. II	Lit. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Lab.-Mgmt. Rel.	Human Rel. I	Human Rel. II
	Law I	Law II	Law III

**MANAGEMENT INFORMATION SYSTEMS****Bachelor of Science Degree**

				quarter hours
<b>Basic Courses—required</b>				
10.501,	10.502,	10.503	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
30.504,	30.505,	30.506	English I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				<b>36</b>
<b>Additional Courses—required</b>				
16.501,	16.502,	16.503	Natural Science I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
			Art, Music, or Theatre Arts	6
				<b>24</b>
<b>Core Courses—required</b>				
39.511,	39.512,	39.513	Statistics I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6
44.507,	44.508,	44.509	Corporate Finance I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
		45.510	Labor-Management Relations	2
	45.511,	45.512	Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				<b>54</b>
<b>Major Concentration Courses—required</b>				
10.504,	10.505,	10.506	Mathematics for Scientific Business Management I, II, III	6
		26.534	Logic I	2
		45.573	Basic Computer Programming	2
45.574,	45.575		Computer Programming for Business I, II	4
	45.576		COmmon Business Oriented Languages	2
	45.577		Data Systems Administration	2
45.578,	45.579		Business Data Processing Applications I, II	4
45.586,	45.587,	45.588	Systems Design and Techniques I, II, III	6
45.589,	45.590,	45.591	Advanced Systems Design I, II, III	6
45.592,	45.593,	45.594	Advanced Systems Techniques I, II, III	6
		45.630	Introduction to Operations Research	2
	45.631,	45.632	Operations Research Applications I, II	4
				<b>46</b>
<b>Electives</b>				<b>14</b>
<b>Total Credits</b>				<b>174</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**MANAGEMENT INFORMATION SYSTEMS**

**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	E. D. P. I	E. D. P. II	E. D. P. III
	Math. I	Math. II	Math. III
<b>3rd Year</b>	Sys. Des.-Tech. I	Sys. Des.-Tech. II	Sys. Des.-Tech. III
	Lit. I	Lit. II	Lit. III
	Law I	Law II	Law III
	Mktg. I	Mktg. II	Mktg. III
<b>4th Year</b>	Logic I	Elective	Elective
	Nat. Sci. I	Nat. Sci. II	Nat. Sci. III
	Stat. I	Stat. II	Stat. III
	Cap. Inst.—	Cap. Inst.—	Cap. Inst.—
	Risk Mgmt. I	Risk Mgmt. II	Risk Mgmt. III
	Math.-Sci. Bus.	Math.-Sci. Bus.	Math.-Sci. Bus.
<b>5th Year</b>	Mgmt. I	Mgmt. II	Mgmt. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Soc. I	Soc. II	Soc. III
	Corp. Fin. I	Corp. Fin. II	Corp. Fin. III
<b>6th Year</b>	Basic Comp. Prog.	Comp. Prog.-Bus. I	Comp. Prog.-Bus. II
	Phil. I	Phil. II	Phil. III
	Psych. I	Psych. II	Psych. III
	Lab.-Mgmt. Rel.	Human Rel. I	Human Rel. II
<b>7th Year</b>	Adv. Sys. Des. I	Adv. Sys. Des. II	Adv. Sys. Des. III
	Intro. Oper. Res.	O. R. Appl. I	O. R. Appl. II
	Adv. Sys. Tech. I	Adv. Sys. Tech. II	Adv. Sys. Tech. III
	Elective	Elective	Elective
<b>8th Year</b>	Art, Music	Art, Music	Art, Music
	COBOL	D. P. Appl. I	D. P. Appl. II
	Data Sys. Admin.	Elective	Elective

**MARKETING****Bachelor of Science Degree**

			quarter hours
<b>Basic Courses—required</b>			
10.501,	10.502,	10.503	Mathematics I, II, III
19.501,	19.502,	19.503	Psychology I, II, III
23.501,	23.502,	23.503	Western Civilization I, II, III
30.504,	30.505,	30.506	English I, II, III
30.507,	30.508,	30.509	Introduction to Literature I, II, III
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III
			<b>36</b>
<b>Additional Courses—required</b>			
16.501,	16.502,	16.503	Natural Science I, II, III
21.501,	21.502,	21.503	Sociology I, II, III
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III
			Art, Music, or Theatre Arts
			<b>24</b>
<b>Core Courses—required</b>			
39.511,	39.512,	39.513	Statistics I, II, III
41.501,	41.502,	41.503	Accounting Principles I, II, III
43.501,	43.502,	43.503	Introduction to Marketing I, II, III
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III
44.507,	44.508,	44.509	Corporate Finance I, II, III
45.501,	45.502,	45.503	Management and Organization I, II, III
		45.510	Labor-Management Relations
	45.511,	45.512	Human Relations in Personnel I, II
45.541,	45.542,	45.543	Law I, II, III
45.570,	45.571,	45.572	Electronic Data Processing I, II, III
			<b>54</b>
<b>Major Concentration Courses—required</b>			
		41.536	Distribution Cost Analysis
43.507,	43.508,	43.509	Sales Force Management I, II, III
43.511,	43.512,	43.513	Creative Marketing I, II, III
	43.518,	43.519	Retailing I, II
		43.520	Industrial Marketing
43.525,	43.526	43.526	Market Research I, II
		43.529	Introduction to International Marketing
43.532,	43.533	43.533	Marketing Management I, II
		43.537	Sales Seminar
	43.541	43.541	Public Relations I
		44.521	Credit Management I
			<b>36</b>
<b>Electives</b>			<b>24</b>
<b>Total Credits</b>			<b>174</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**MARKETING**
**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I Acctg. I Mgmt. & Org. I	English II Acctg. II Mgmt. & Org. II	English III Acctg. III Mgmt. & Org. III
<b>2nd Year</b>	Econ. I Cap. Inst.— Risk Mgmt. I Math. I Mktg. I	Econ. II Cap. Inst.— Risk Mgmt. II Math. II Mktg. II	Econ. III Cap. Inst.— Risk Mgmt. III Math. III Mktg. III
<b>3rd Year</b>	Lit. I Law I Sales Force Mgmt. I Elective	Lit. II Law II Sales Force Mgmt. II Elective	Lit. III Law III Sales Force Mgmt. III Elective
<b>4th Year</b>	Nat. Sci. I Stat. I E. D. P. I Creat. Mktg. I	Nat. Sci. II Stat. II E. D. P. II Creat. Mktg. II	Nat. Sci. III Stat. III E. D. P. III Creat. Mktg. III
<b>5th Year</b>	West. Civ. I Soc. I Corp. Fin. I Retail. I	West. Civ. II Soc. II Corp. Fin. II Retail. II	West. Civ. III Soc. III Corp. Fin. II Ind. Mktg.
<b>6th Year</b>	Phil. I Psych. I Lab.-Mgmt. Rel. Mkt. Res. I	Phil. II Psych. II Human Rel. I Mkt. Res. II	Phil. III Psych. III Human Rel. II Intro. Int'l Mktg.
<b>7th Year</b>	Art, Music Mktg. Mgmt. I Cred. Mgmt. I	Art, Music Mktg. Mgmt. II Pub. Rel. I	Art, Music Dist. Cost Anal. Sales Seminar
<b>8th Year</b>	Elective Elective Elective	Elective Elective Elective	Elective Elective Elective

<b>MARKETING</b>	<b>Associate in Science Degree</b>	
		<b>quarter hours</b>
<b>Basic Courses—required</b>		
10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		<b>36</b>
<b>Core Courses—required</b>		
39.511, 39.512, 39.513	Statistics I, II, III	6
41.501, 41.502, 41.503	Accounting Principles I, II, III	6
43.501, 43.502, 43.503	Introduction to Marketing I, II, III	6
45.501, 45.502, 45.503	Management and Organization I, II, II	6
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6
		<b>30</b>
<b>Major Concentration Courses—required</b>		
	41.536 Distribution Cost Analysis	2
43.507, 43.508, 43.509	Sales Force Management I, II, III	6
43.511, 43.512, 43.513	Creative Marketing I, II, III	6
43.518,	Retailing I, II	4
	43.520 Industrial Marketing	2
43.525,	Market Research I, II	4
	43.529 Introduction to International Marketing	2
43.532, 43.533	Marketing Management I, II	4
		<b>30</b>
<b>Total Credits</b>		<b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**MARKETING**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Marketing I	Marketing II	Marketing III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	Psych. I	Psych. II	Psych. III
	Math. I	Math. II	Math. III
	Sales Force Mgmt. I	Sales Force Mgmt. II	Sales Force Mgmt. III
<b>3rd Year</b>	E. D. P. I	E. D. P. II	E. D. P. III
	Stat. I	Stat. II	Stat. III
	Retail. I	Retail. II	Dist. Cost. Anal.
	Mkt. Res. I	Mkt. Res. II	Intro. Int'l Mktg.
<b>4th Year</b>	Lit. I	Lit. II	Lit. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Mktg. Mgmt. I	Mktg. Mgmt. II	Ind. Mktg.
	Creat. Mktg. I	Creat. Mktg. II	Creat. Mktg. III

**PERSONNEL AND INDUSTRIAL RELATIONS Bachelor of Science Degree**

				quarter hours
10.501,	10.502,	10.503	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
30.504,	30.505,	30.506	English I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				<b>36</b>
<b>Core Courses—required</b>				<b>—</b>
16.501,	16.502,	16.503	Natural Science I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
			Art, Music, or Theatre Arts	6
				<b>24</b>
<b>Core Courses—required</b>				<b>—</b>
39.511,	39.512,	39.513	Statistics I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III	6
44.507,	44.508,	44.509	Corporate Finance I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
		45.510	Labor-Management Relations	2
	45.511,	45.512	Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				<b>54</b>
<b>Major Concentration Courses—required</b>				<b>—</b>
	45.513,	45.514,	19.532 Introduction to Industrial Psychology	2
			45.515 Personnel Management I, II, III	6
			45.517 Techniques of Employee Selection	2
			45.518 Wage and Salary Administration	2
			45.521 Employee Benefits and Social Security	2
			45.522 Job Evaluation	2
			45.545 Law of Employment Standards	2
			45.546 Law of Employment Conditions	2
			45.548 Law of Labor Management Relations	2
			45.555 Recent Labor and Social Law	2
			45.557 International Labor Movements	2
			45.558 Industrial Relations Systems	2
			45.560 Seminar on Labor Issues	2
				<b>30</b>
<b>Electives</b>				<b>—</b>
				<b>30</b>
<b>Total Credits</b>				<b>174</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**PERSONNEL AND INDUSTRIAL RELATIONS**

**Recommended Course Sequence for the 8-Year Program  
Leading to the Bachelor of Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	Cap. Inst.—	Cap. Inst.—	Cap. Inst.—
	Risk Mgmt. I	Risk Mgmt. II	Risk Mgmt. III
<b>3rd Year</b>	Law I	Law II	Law III
	Elective	Elective	Elective
	Lit. I	Lit. II	Lit. III
<b>4th Year</b>	Math. I	Math. II	Math. III
	Intro. Mktg. I	Intro. Mktg. II	Intro. Mktg. III
	Ind. Psych.	Human Rel. I	Human Rel. II
<b>5th Year</b>	Nat. Sci. I	Nat. Sci. II	Nat. Sci. III
	Stat. I	Stat. II	Stat. III
	E. D. P. I	E. D. P. II	E. D. P. III
<b>6th Year</b>	Pers. Mgmt. I	Pers. Mgmt. II	Pers. Mgmt. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Soc. I	Soc. II	Soc. III
<b>7th Year</b>	Corp. Fin. I	Corp. Fin. II	Corp. Fin. III
	Lab.-Mgmt. Rel.	Wage Sal. Adm.	Empl. Ben. & S. S.
	Phil. I	Phil. II	Phil. III
<b>8th Year</b>	Psych. I	Psych. II	Psych. III
	Job. Eval.	Law Lab.-Mat. Rel.	Tech. Emp. Sel.
	Law Emp. Stand.	Law Emp. Cond.	Rec. Lab.-Soc. Law
<b>7th Year</b>	Art, Music	Art, Music	Art, Music
	Elective	Elective	Elective
	Elective	Elective	Elective
<b>8th Year</b>	Int'l Lab. Mvmt.	Ind. Rel. Sys.	Sem.—Lab. Issues
	Elective	Elective	Elective
	Elective	Elective	Elective

**PERSONNEL AND INDUSTRIAL RELATIONS Associate in Science Degree**

					quarter hours
10.501,	10.502,	10.503	Mathematics I, II, III		6
19.501,	19.502,	19.503	Psychology I, II, III		6
23.501,	23.502,	23.503	Western Civilization I, II, III		6
30.504,	30.505,	30.506	English I, II, III		6
30.507,	30.508,	30.509	Introduction to Literature I, II, III		6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	<b>36</b>
					<hr/>
<b>Core Courses—required</b>					
39.511,	39.512,	39.513	Statistics I, II, III		6
41.501,	41.502,	41.503	Accounting Principles I, II, III		6
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III		6
45.501,	45.502,	45.503	Management and Organization I, II, III		6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	<b>30</b>
					<hr/>
<b>Major Concentration Courses—required</b>					
		19.532	Introduction to Industrial Psychology		2
		39.527	Labor Economics		2
		45.510	Labor Management Relations		2
	45.511,	45.512	Human Relations in Personnel I, II		4
45.513,	45.514,	45.515	Personnel Management I, II, III		6
		45.518	Wage Salary Administration		2
		45.521	Employee Benefits and Social Security		2
		45.545	Law of Employment Standards		2
		45.546	Law of Employment Conditions		2
		45.548	Law of Labor Management Relations		2
		45.553	Labor Agreement		2
		45.556	Negotiation, Mediation, and Arbitration	2	<b>30</b>
			<b>Total Credits</b>		<hr/> <b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

## PERSONNEL AND INDUSTRIAL RELATIONS

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	Quarter 1	Quarter 2	Quarter 3
<b>1st Year</b>	English I Acctg. I Mgmt. & Org. I Math. I	English II Acctg. II Mgmt. & Org. II Math. II	English III Acctg. III Mgmt. & Org. III Math. III
<b>2nd Year</b>	Econ. I Psych. I Cap. Inst.— Risk Mgmt. I Ind. Psych.	Econ. II Psych. II Cap. Inst.— Risk Mgmt. II Human Rel. I	Econ. III Psych. III Cap. Inst.— Risk Mgmt. III Human Rel. II
<b>3rd Year</b>	E. D. P. I Stat. I Pers. Mgmt. I Lab.-Mgmt. Rel.	E. D. P. II Stat. II Pers. Mgmt. II Wage-Sal. Admin.	E. D. P. III Stat. III Pers. Mgmt. III Lab. Econ.
<b>4th Year</b>	Lit. I West. Civ. I Empl. Ben. & S. S. Law Empl. Stand.	Lit. II West. Civ. II Lab. Agree. Law Empl. Cond.	Lit. III West. Civ. III Neg., Med.—Arbit. Law Lab.-Mgmt. Rel.



<b>PURCHASING</b>			<b>Associate in Science Degree</b>
			<b>quarter hours</b>
10.501,	10.502,	10.503	Mathematics I, II, III
19.501,	19.502,	19.503	Psychology I, II, III
23.501,	23.502,	23.503	Western Civilization I, II, III
30.504,	30.505,	30.506	English I, II, III
30.507,	30.508,	30.509	Introduction to Literature I, II, III
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III
			6
			6
			6
			6
			6
			36
			<u>—</u>
<b>Core Courses—required</b>			
39.511,	39.512,	39.513	Statistics I, II, III
41.501,	41.502,	41.503	Accounting Principles I, II, III
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III
45.501,	45.502,	45.503	Management and Organization I, II, III
45.570,	45.571,	45.572	Electronic Data Processing I, II, III
			6
			6
			6
			6
			30
			<u>—</u>
<b>Major Concentration Courses—required</b>			
44.521,	44.522,	44.523	Industrial Marketing
45.506,	45.507,	45.508	Credit Management I, II, III
		45.509	Industrial Management I, II, III
		45.510	Production Processes
		45.511,	Labor Management Relations
		45.512	Human Relations in Personnel I, II
		45.527	Value Engineering
45.537,	45.538,	45.539	Purchasing I, II, III
			4
			2
			2
			6
			2
			30
			<u>—</u>
<b>Total Credits</b>			<b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**PURCHASING**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	Psych. I	Psych. II	Psych. III
	Cap. Inst.—	Cap. Inst.—	Cap. Inst.—
	Risk Mgmt. I	Risk Mgmt. II	Risk Mgmt. III
<b>3rd Year</b>	Ind. Mgmt. I	Ind. Mgmt. II	Ind. Mgmt. III
	E. D. P. I	E. D. P. II	E. D. P. III
	Stat. I	Stat. II	Stat. III
	Purch. I	Purch. II	Purch. III
<b>4th Year</b>	Lab.-Mgmt. Rel.	Human Rel. I	Human Rel. II
	Lit. I	Lit. II	Lit. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Ind. Mktg.	Prod. Processes	Value Engr.
	Credit Mgmt. I	Credit Mgmt. II	Credit Mgmt. III

<b>REAL ESTATE</b>			<b>Associate in Science Degree</b>
			<b>quarter hours</b>
<b>Basic Courses—required</b>			
10.501,	10.502,	10.503	Mathematics I, II, III
19.501,	19.502,	19.503	Psychology I, II, III
23.501,	23.502,	23.503	Western Civilization I, II, III
30.504,	30.505,	30.506	English I, II, III
30.507,	30.508,	30.509	Introduction to Literature I, II, III
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III
			<b>6</b>
			<b>36</b>
<b>Core Courses—required</b>			
39.511,	39.512,	39.513	Statistics I, II, III
41.501,	41.502,	41.503	Accounting Principles I, II, III
44.501,	44.502,	44.503	Capital Institutions and Risk Management I, II, III
45.501,	45.502,	45.503	Management and Organization I, II, III
45.541,	45.542,	45.543	Law I, II, III
			<b>6</b>
			<b>6</b>
			<b>6</b>
			<b>30</b>
<b>Major Concentration Courses—required</b>			
45.649,	45.650,	45.651	Law of Real Estate I, II, III
47.501,	47.502		Real Estate Fundamentals I, II
	47.506		Real Estate Construction Principles
47.508,	47.509		Real Estate Financial Analysis I, II
	47.510		Real Estate Management
	47.511		Residential Real Estate Appraisal
47.512,	47.513		Commercial and Industrial Real Estate Appraisal I, II
47.521,	47.522,	47.523	Urban Planning, Rehabilitation and Development I, II, III
			<b>6</b>
<b>Total Credits</b>			<b>96</b>

Students following a degree program should refer to the suggested course sequence on the opposite page.

**REAL ESTATE**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I Acctg. I Mgmt. & Org. I Cap. Inst.— Risk Mgmt. I	English II Acctg. II Mgmt. & Org. II Cap. Inst.— Risk Mgmt. II	English III Acctg. III Mgmt. & Org. III Cap. Inst.— Risk Mgmt. III
<b>2nd Year</b>	Econ. I Law I Math. I R. E. Fund. I	Econ. II Law II Math. II R. E. Fund. II	Econ. III Law III Math. III R. E. Constr. Prin.
<b>3rd Year</b>	R. E. Law I Stat. I R. E. Fin. Anal. I R. E. Appraisal I	R. E. Law II Stat. II R. E. Fin. Anal. II C. & I. R. E. App. I	R. E. Law III Stat. III R. E. Mgt. C. & I. R. E. App. II
<b>4th Year</b>	Lit. I West. Civ. I Urban Plan. I Psych. I	Lit. II West. Civ. II Urban Plan. II Psych. II	Lit. III West. Civ. III Urban Plan. III Psych. III



**TRANSPORTATION MANAGEMENT****Associate in Science Degree**

quarter hours

**Basic Courses—required**

10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		<b>36</b>

**Core Courses—required**

39.511, 39.512, 39.513	Statistics I, II, III	6
41.501, 41.502, 41.503	Accounting Principles I, II, III	6
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III	6
45.501, 45.502, 45.503	Management and Organization I, II, III	6
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6
		<b>30</b>

**Major Concentration Courses—required**

48.501, 48.502, 48.503	Transportation Management I, II, III	6
48.504, 48.505, 48.506	Trans. Regulation and Promotion I, II, III	6
48.511, 48.512, 48.513	Mature Transportation Systems I, II, III	6
48.517, 48.518, 48.519	Modern Transportation Systems I, II, III	6
48.524, 48.525, 48.526	Trans. Economics and Pricing I, II, III	6
		<b>30</b>

**Total Credits****96**

Students following a degree program should refer to the suggested course sequence on the opposite page.

**TRANSPORTATION MANAGEMENT**

**Recommended Course Sequence for the 4-Year Program  
Leading to the Associate in Science Degree**

	<b>Quarter 1</b>	<b>Quarter 2</b>	<b>Quarter 3</b>
<b>1st Year</b>	English I	English II	English III
	Acctg. I	Acctg. II	Acctg. III
	Mgmt. & Org. I	Mgmt. & Org. II	Mgmt. & Org. III
	Math. I	Math. II	Math. III
<b>2nd Year</b>	Econ. I	Econ. II	Econ. III
	E. D. P. I	E. D. P. II	E. D. P. III
	Cap. Inst.—	Cap. Inst.—	Cap. Inst.—
	Risk Mgmt. I	Risk Mgmt. II	Risk Mgmt. III
	Trans. Mgmt. I	Trans. Mgmt. II	Trans. Mgmt. III
<b>3rd Year</b>	Psych. I	Psych. II	Psych. III
	Stat. I	Stat. II	Stat. III
	Trans. Reg. & Prom. I	Trans. Reg. & Prom. II	Trans. Reg. & Prom. III
	Mat. Trans. Sys. I	Mat. Trans. Sys. II	Mat. Trans. Sys. III
<b>4th Year</b>	Lit. I	Lit. II	Lit. III
	West. Civ. I	West. Civ. II	West. Civ. III
	Mod. Trans. Sys. I	Mod. Trans. Sys. II	Mod. Trans. Sys. III
	Trans. Econ. & Prcg. I	Trans. Econ. & Prcg. II	Trans. Econ. & Prcg. III

**COMBINED PROGRAM IN LIBERAL ARTS AND MANAGEMENT****Bachelor of Science Degree**

quarter hours

**LIBERAL ARTS COURSES****Basic Courses—required**

10.501,	10.502,	10.503	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
30.504,	30.505,	30.506	English I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				<b>36</b>
				<hr/>

**Core Courses—required**

16.501,	16.502,	16.503	Natural Science I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6
23.504,	23.505,	23.506	U. S. History I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
Fine Arts:			Art, Music, or Theatre Arts	6
Literature:			English, American, or other in translation	6
				<b>42</b>
				<hr/>

**Elective Courses in Liberal Arts****24****MANAGEMENT COURSES****Core Courses—required**

39.511,	39.512,	39.513	Statistics I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
43.501,	43.502,	43.503	Introduction to Marketing I, II, III	6
44.501,	44.502,	44.503	Capital Inst. and Risk Management I, II, III	6
45.501,	45.502,	45.503	Management and Organization I, II, III	6
45.507,	45.508,	45.509	Corporate Finance I, II, III	6
		45.510	Labor Management Relations	2
	45.511,	45.512	Human Relations in Personnel I, II	4
45.541,	45.542,	45.543	Law I, II, III	6
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6
				<b>54</b>
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**Elective Courses in Business Area****18****Total Credits****174**

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# liberal arts

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## Aims

In providing the means to a modern liberal education, University College has the main objective of stimulating and guiding the self-development of the student in three main areas: first, his intellectual growth; second, the development of his character and sense of values; and, third, his preparation for, or advancement in, a career.

Intellectual growth—the development of the ability to think independently and creatively—rests upon the foundation of a sound general education. Through the Liberal Arts curricula, students are guided toward an appreciative understanding of the active discovery of ideas and methods in the areas of humanities, natural science, and social science. With this training, the student can more fully realize the basic values upon which civilization rests and can more fully participate in the intellectual, moral, and material achievement of that civilization.

Through its many programs, University College endeavors to provide experiences conducive to the development of strength of character and a sense of personal responsibility, including such personal qualities as self-reliance, integrity, perseverance, and the ability to work with others.

University College holds that there is no inconsistency between a truly liberal education and preparation for a vocation. As an adventure in intellectual discovery, a liberal education leads to the broadening and intensification of interests as the student becomes aware of his own mental strengths and weaknesses. This discovery is essential for making more intelligent and realistic appraisals of himself and his career. His career brings meaning and focus to his educational experience. His education presents both a challenge to accept responsibility and an opportunity to seek knowledge and skills for himself.

## Methods

To enable each student to plan a college program in keeping with his own interests and aptitudes, a wide range of electives is offered. This does not mean that students are free to elect courses indiscriminately, for if they are to obtain a liberal education they must have training in several basic fields. Therefore, the Curriculum Committee of University College has established basic minimum requirements in each of several fields. These distribution requirements are outlined with each of the program offerings.

### **Programs of Study**

To achieve the aims established for the programs in Liberal Arts, of serving men and women who are engaged in full-time employment during the day, the College offers curricula leading to the baccalaureate and associate degrees. The various individual courses of study are outlined on the following pages. Course descriptions are listed in numerical order by departments beginning on page 121.

#### **The Bachelor of Science Degree**

Major fields of study are offered in Economics, English, Fine Arts, Political Science, History, Psychology, and Sociology-Anthropology. Students should choose their major field of study and their electives in consultation with a program adviser.

The distribution requirements, including specific required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific career objectives.

Each curriculum normally provides for not less than 174 quarter hours of work, including at least 40 quarter hours of advanced work in a major field, and at least 30 quarter hours of elective liberal arts courses.

All candidates for the Bachelor of Science degree must have satisfactorily completed in college one full year of a modern language beyond the elementary level.

No student transferring from another college or university is eligible to receive a degree until at least 40 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

#### **The Associate in Science Degree**

The program leading to the associate degree is offered for those desiring a general cultural background in the liberal arts and humanities, but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree in Liberal Arts must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements (174 quarter hours) for the Bachelor of Science degree.

To provide a balanced program which will achieve the established objectives, the faculty has set a minimum credit requirement in the several areas of study as listed on page 96.

**Acceptance of Credits by the College of Liberal Arts\***

The College of Liberal Arts permits its students to enroll for credit in all courses in University College offered on a quarterly basis when they are pertinent to the student's program and have been approved by the Dean of the College of Liberal Arts. The credits for such courses may be applied

1. To the total number of credits needed for graduation
2. To satisfy distribution requirements
3. To fulfill language and Major deficiencies

Credits from University College, as well as those from other accredited institutions, may not, however, be applied to the Quality Point Average of students in the College of Liberal Arts except when such credits are from courses taken as substitutes for those College of Liberal Arts courses failed by students. In such instances students must receive a grade of C or better in the University College courses and then only 2.0 quality points are applied to the student's record for each course.

**Transfer of Students to the College of Liberal Arts\***

Those students enrolled in University College who wish to transfer to the College of Liberal Arts must apply through the Department of Admissions of the Basic Colleges.



\*One of the Basic (day) Colleges of Northeastern University

## SUGGESTED COURSE SEQUENCE FOR STUDENTS FOLLOWING LIBERAL ARTS DEGREE PROGRAMS

All new students should discuss their program with a program adviser before attempting to undertake the following sequence of courses:

Quarter 1			Quarter 2			Quarter 3		
No.	Course	q.h.	No.	Course	q.h.	No.	Course	q.h.
<b>FIRST YEAR</b>								
10.501	Math. I	2	10.502	Math. II	2	10.503	Math. III	2
23.501	West. Civ. I	2	23.502	West. Civ. II	2	23.503	West. Civ. III	2
30.504	English I	2	30.505	English II	2	30.506	English III	2
	Core Course	2		Core Course	2		Core Course	2
<b>SECOND YEAR</b>								
19.501	Psych I	2	19.502	Psych II	2	19.503	Psych. III	2
30.507	Intro. to Lit. I	2	30.508	Intro. to Lit. II	2	30.509	Intro. to Lit. III	2
	Core Course	2		Core Course	2		Core Course	2
	Maj. Con. Course	2		Maj. Con. Course	2		Maj. Con. Course	2
<b>THIRD YEAR</b>								
39.501	Econ. I	2	39.502	Econ. II	2	39.503	Econ. III	2
	Language	3		Language	3		Language	3
	Core Course or Maj. Con. Course	2		Core Course or Maj. Con. Course	2		Core Course or Maj. Con. Course	2
<b>FOURTH YEAR</b>								
	Language	3		Language	3		Language	3
	Core Course	2		Core Course	2		Core Course	2
	Core Course or Maj. Con. Course	2		Core Course or Maj. Con. Course	2		Core Course or Maj. Con. Course	2

**Fifth and succeeding years:** Program should include at least one Core Course and one Major Concentration Course each year.

**ECONOMICS****Bachelor of Science Degree**

			quarter hours
<b>Basic Courses—required</b>			
10.501,	10.502,	10.503	Mathematics I, II, III 6
19.501,	19.502,	19.503	Psychology I, II, III 6
23.501,	23.502,	23.503	Western Civilization I, II, III 6
30.504,	30.505,	30.506	English I, II, III 6
30.507,	30.508,	30.509	Introduction to Literature I, II, III 6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III 6 <b>36</b>
<b>Core Courses—required</b>			<b>—</b>
16.501,	16.502,	16.503	Natural Science I, II, III 6
21.501,	21.502,	21.503	Sociology I, II, III 6
22.501,	22.502,	22.503	Principles of Political Science I, II, III 6
23.504,	23.505,	23.506	U. S. History I, II, III 6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III 6
Fine Arts:			Art, Music, or Theatre Arts 6
Literature:			English, American, or other in translation 6
Modern Language:*			Elementary 9
			Intermediate 9
Science or Mathematics			6 <b>66</b>
<b>Major Concentration Courses—required</b>			<b>—</b>
	39.500	Economic Geography	2
39.507,	39.508,	39.509	Intermediate Economic Theory I, II, III 6
39.511,	39.512,	39.513	Statistics I, II, III 6
	39.517,	39.518	Money and Banking I, II 4
		39.519	Public Finance 2
		39.521	Introduction to Economic Growth and Development 2
	39.522	Economic Development	2
	39.525	American Economic History	2
	39.526	Government and Business	2
	39.527	Labor Economics	2
39.528,	39.529	International Economics I, II	4
	39.530	Comparative Economic Systems	2
39.531,	39.532	Business Cycles I, II	4
	39.533	Business Planning and Research	2
39.536,	39.537	Statistical Methods in Forecasting I, II	4
	39.540	History of Economic Thought 2 <b>48</b>	
<b>Elective Courses**</b>			<b>—</b>
			<b>24</b>
			<hr/> <b>174</b>
<b>Total Credits</b>			

\*One full year of a modern language beyond the elementary level is a requirement for graduation.

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**ENGLISH****Bachelor of Science Degree**

			quarter hours
<b>Basic Courses—required</b>			
10.501,	10.502,	10.503	Mathematics I, II, III
19.501,	19.502,	19.503	Psychology I, II, III
23.501,	23.502,	23.503	Western Civilization I, II, III
30.504,	30.505,	30.506	English I, II, III
30.507,	30.508,	30.509	Introduction to Literature I, II, III
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III
			<b>6</b>
			<b>36</b>
			<b>—</b>
<b>Core Courses—required</b>			
16.501,	16.502,	16.503	Natural Science I, II, III
21.501,	21.502,	21.503	Sociology I, II, III
22.501,	22.502,	22.503	Principles of Political Science I, II, III
23.504,	23.505,	23.506	U. S. History I, II, III
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III
30.531,	30.532,	30.533	Western World Literature I, II, III
Fine Arts:			Art, Music, or Theatre Arts
Modern Language:*			Elementary
			9
			Intermediate
Science or Mathematics			9
			<b>6</b>
			<b>66</b>
			<b>—</b>

(continued on following page)



\*One full year of a modern language beyond the elementary level is a requirement for graduation.

**Major Concentration Courses—required**

29.525	Modern British Drama or	}	2
29.526	Modern American Drama		
30.517	Intermediate Writing		2
30.521	The English Language		2
30.522	Introduction to Semantics		2
30.534, 30.535,	30.536 Western World Literature IV, V, VI		6
30.541, 30.542,	30.543 English Literature I, II, III		6
30.544, 30.545,	30.546 American Literature I, II, III		6
30.551, 30.552,	30.553 Chaucer I, II, III or	}	6
30.554, 30.555,	30.556 Shakespeare I, II, III		
30.557, 30.558,	30.559 Restoration Literature, The Age of Pope and Swift, The Age of Johnson or	}	6
30.571, 30.572,	30.573 Romantic Poets of the 19th Century I, II, III		
The remaining eight hours must be taken from the following courses:			
30.574	The 18th-Century English Novel	2	
30.575	The 19th-Century English Novel	2	
30.576	The 20th-Century English Novel	2	
30.581	The American Short Story	2	
30.582	The 19th-Century American Novel	2	
30.583	The 20th-Century American Novel	2	
30.584	Contemporary American Poetry	2	46
Elective Courses**			—
			26
			<hr/> <b>174</b>

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**FINE ARTS****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		<b>36</b>
		—

**Core Courses—required**

16.501, 16.502, 16.503	Natural Science I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
22.501, 22.502, 22.503	Principles of Political Science I, II, III	6
23.504, 23.505, 23.506	U. S. History I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
Fine Arts:	Art, Music, or Theatre Arts	6
Literature:	English, American, or other in translation	6
Modern Language:*	Elementary	9
	Intermediate	9
Science or Mathematics		6
		<b>66</b>
		—

**Major Concentration Courses—required**

27.504, 27.505, 27.506	Survey of Western Art I, II, III	6
27.591	Art Seminar (senior level)	2

In addition to the two courses above, required of all Fine Arts majors, each student will select a minimum of 36 quarter hours from either Area I or Area II.

**Area I—Art History Major**

At least two courses must be completed from each group.

**Group I**

27.507	Ancient Architecture	2
27.508	Medieval and Renaissance Architecture	2
27.511	History of Ancient Art	2
27.512	History of Medieval Art	2

**Group II**

27.509	European Architecture	2
27.515	Modern Painting	2
27.524, 27.525, 27.526	History of American Art I, II, III	6

**Group III**

27.531, 27.532,	27.533	Oriental Art I, II, III	6
	27.534	Russian Art	2
	27.535	African Art	2
	27.536	Latin American Art	2

(continued on following page)

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\*One full year of a modern language beyond the elementary level is a requirement for graduation.

**Group IV**

27.513	Italian Renaissance Art	2
27.514	European Art	2
27.521	Spanish Art	2
27.522	French Art	2
27.523	English Art	2

**Area II—Applied Art Major**

Required:

27.541, 27.542, 27.543	Drawing I, II, III	9
27.561, 27.562, 27.563	Basic Color and Design	9

Eighteen hours must be taken from the following courses:

**Group I**

27.544	Graphic Arts—Woodcutting	3
27.545	Graphic Arts—Etching	3
27.546	Graphic Arts—Lithography	3

**Group II**

27.551, 27.552,	27.553	Painting—Basic Level I, II, III	9
	27.554	Painting—Advanced Level	3
	27.564	Advanced Color and Design	3

**Group III**

27.571, 27.572,	27.573	Business Commercial Design I, II, III	9
	27.574	Advanced Commercial Design	3
27.577, 27.578,	27.579	Stained Glass Design I, II, III	9

**Group IV**

27.581	Basic Sculpture	3
27.584, 27.585	Ceramics I, II	6
		—

<b>Elective Courses**</b>		<b>28</b>
		<b>174</b>

**Total Credits**

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**HISTORY****Bachelor of Science Degree**

		quarter hours
<b>Basic Courses—required</b>		
10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		<u>—</u>
<b>Core Courses—required</b>		
16.501, 16.502, 16.503	Natural Science I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
22.501, 22.502, 22.503	Principles of Political Science I, II, III	6
23.504, 23.505, 23.506	U. S. History I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
Fine Arts:	Art, Music, or Theatre Arts	6
Literature:	English, American, or other in translation	6
Modern Language:*	Elementary	9
	Intermediate	9
Science or Mathematics		6
		<u>—</u>
<b>Major Concentration Courses—required</b>		
Each student will select a minimum of 40 hours from the following areas, with the provision that at least five courses must be completed from each area:		

**Area I**

23.521	Ancient Middle East	2
23.522	Ancient Greece	2
23.523	Ancient Rome	2
23.524	Early Middle Ages	2
23.525	Late Middle Ages	2
23.526	Early Modern Europe	2
23.527	England, 500–1603	2

**Area II**

23.541	Europe, 1688–1789	2
23.542	Europe, 1789–1870	2
23.543	Europe, 1870–1914	2
23.544	Europe, 1914–1939	2
23.545	Europe since 1939	2
23.548	England, 1603–1815	2
23.549	England since 1815	2
23.552	English Constitutional History to 1485	2
23.553	English Constitutional History since 1485	2
23.554	France since 1815	2
23.555	Germany since 1815	2
23.556	Italy since 1815	2

(continued on following page)

\*One full year of a modern language beyond the elementary level is a requirement for graduation.

**Area III**

23.561	Colonial America to 1689	2
23.562	Colonial America, 1689–1763	2
23.563	American Revolution and Constitution	2
23.564	Topics in American Constitutional History to 1900	2
23.565	Topics in 20th-Century American Constitutional History	2
23.566	United States since 1933	2
23.567	Topics in American Diplomatic History	2
23.568	Topics in American Social History	2
23.569	Topics in American Economic History	2

**Area IV**

23.581	Latin America to 1826	2
23.582	Latin America, 1826–1920	2
23.583	Contemporary Latin America	2
23.584	The Far East before 1850	2
23.585	China since 1850	2
23.586	Japan since 1850	2
23.588	Africa North of Sahara	2
23.589	Africa South of Sahara	2
23.591	Modern Middle East	2
23.592	India and Pakistan	2
23.593	Southeast Asia	2
23.594	Russia, 1450–1801	2
23.595	Russia, 1801–1917	2
23.596	Russia since 1917	2

**40****Elective Courses\*\*****32****Total Credits****174**

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**LIBERAL ARTS****Associate in Science Degree**

quarter hours

**Basic Courses—required**

10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		<b>36</b>

**Core Courses—required**

21.501, 21.502, 21.503	Sociology I, II, III	6
22.501, 22.502, 22.503	Principles of Political Science I, II, III	6
23.504, 23.505, 23.506	U. S. History I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
Fine Arts:	Art, Music, or Theatre Arts	6
Literature:	English, American, or other in translation	6
		<b>36</b>

**Electives**

	<b>Total Credits</b>	<b>24</b>
		<b>96</b>



**POLITICAL SCIENCE****Bachelor of Science Degree**

quarter hours

10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		36
		—

**Core Courses—required**

16.501, 16.502, 16.503	Natural Science I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
22.501, 22.502, 22.503	Principles of Political Science I, II, III	6
23.504, 23.505, 23.506	U. S. History I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
Fine Arts:	Art, Music, or Theatre Arts	6
Literature:	English, American, or other in translation	6
Modern Language:*	Elementary	9
	Intermediate	9
Science or Mathematics		6
		66
		—

(continued on following page)



\*One full year of a modern language beyond the elementary level is a requirement for graduation.

**Major Concentration Courses—required**

22.504	Introduction to Political Theory	2
22.505	Contemporary Political Theory	2
22.506	American Political Thought	2

Each student will select a minimum of 34 hours from the following areas:

**Area I**

22.511	American National Government	2
22.512	Urban and Metropolitan Government	2
22.513	Political Parties and Pressure Groups	2
22.514	American Constitutional Law	2
22.515	Civil Rights	2
22.516	Public Administration I	2
22.517	Public Administration II	2
22.518	Government and Politics of the States	2

**Area II**

22.521	Comparative Government I	2
22.522	Comparative Government II	2
22.523	Government and Politics of Latin America	2
22.524	Government and Politics of the Middle East	2
22.525	Government and Politics of the Far East	2
22.526	Government and Politics of Africa	2
22.527	Communism in Eastern Europe	2

**Area III**

22.531	International Relations	2
22.532	International Organization	2
22.533	American Foreign Policy	2
22.534	Soviet Foreign Policy	2

**40****Elective Courses\*\***

<b>Total Credits</b>	<b>32</b>
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**174**


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\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**PSYCHOLOGY****Bachelor of Science Degree**

quarter hours

**Basic Courses—required**

10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		36
		—

**Core Courses—required**

16.501, 16.502, 16.503	Natural Science I, II, III	6
21.501, 21.502, 21.503	Sociology I, II, III	6
22.501, 22.502, 22.503	Principles of Political Science I, II, III	6
23.504, 23.505, 23.506	U. S. History I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
Fine Arts:	Art, Music, or Theatre Arts	6
Literature:	English, American, or other in translation	6
Modern Language:*	Elementary	9
	Intermediate	9
Science or Mathematics		6
		66
		—

**Major Concentration Courses—required**

19.504, 19.505, 19.506	Statistics in Psychology I, II, III	6
19.551, 19.552, 19.553	Experimental Psychology I, II, III	9
19.561, 19.562, 19.563	Historical Development of Psychology I, II, III	6

In addition to the courses listed above, required of all Psychology majors, each student will select a minimum of 22 hours from the following courses:

19.511, 19.512, 19.513	Child and Adolescent Psychology I, II, III	6
19.521	Personality I	2
19.522	Personality II	2
19.523	Motivation	2
19.524, 19.525	Social Psychology I, II	4
19.531	Psychological Testing	2
19.541, 19.542, 19.543	Abnormal Psychology I, II, III	6
19.571	Seminar in Psychology	2
		43
		—

**Elective Courses\*\***

	29
Total Credits	174

\*One full year of a modern language beyond the elementary level is a requirement for graduation.

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

**SOCIOLOGY-ANTHROPOLOGY****Bachelor of Science Degree**

				quarter hours
<b>Basic Courses—required</b>				
10.501,	10.502,	10.503	Mathematics I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
23.501,	23.502,	23.503	Western Civilization I, II, III	6
30.504,	30.505,	30.506	English I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6
				<b>36</b>
<b>Core Courses—required</b>				
16.501,	16.502,	16.503	Natural Science I, II, III	6
21.501,	21.502,	21.503	Sociology I, II, III	6
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6
23.504,	23.505,	23.506	U. S. History I, II, III	6
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6
Fine Arts:			Art, Music, or Theatre Arts	6
Literature:			English, American, or other in translation	6
Modern Language:*			Elementary	9
			Intermediate	9
Science or Mathematics				6
				<b>66</b>
<b>Major Concentration Courses—required</b>				
	20.501		Introduction to Physical Anthropology and Archaeology	2
20.502,	20.503		Cultural Anthropology I, II	4
	20.511		Introduction to Anthropological Field Techniques	2
	20.521		Culture and Personality	2
	21.512		Introduction to Social Research Methods I	2
	21.513		Introduction to Social Research Methods II	2
	21.517		Foundations of Sociological Theory	2
	21.518		Contemporary Sociological Theory I	2
	21.519		Contemporary Sociological Theory II	2
	21.528		Social Stratification	2
	21.531		Social Change	2
	21.534		Social Control	2
	21.547		Social Problems	2

In addition to the courses listed above, required of all Sociology majors, each student will select a minimum of 16 hours from either Area I or Area II. (See following page.)

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\*One full year of a modern language beyond the elementary level is a requirement for graduation.

**Area I—Sociology-Social Work Major****Required:**

21.538,	21.539,	21.540	Introduction to Social Welfare I, II, III	6
21.543,	21.544,	21.545	Introduction to Social Work Practice I, II, III	6
			(may be waived in special circumstances)	

The remaining four hours must be taken from the following courses:

21.548,	21.549	Criminology I, II	4
	21.550	Juvenile Delinquency	2
21.551,	21.552	Family and Marriage I, II	4
21.553,	21.554	Intergroup Relations I, II	4
	21.557	Urban Sociology	2
	21.558	Community Analysis	2
	21.560	Medical Sociology	2
	21.563	Social Gerontology	2
	21.567	Population and Demography	2
	21.570	Sociology of Occupations and Professions	2
	21.573	Sociology of Industry	2
	21.575	Sociology of Formal Organizations	2

**Area II—Sociology-Anthropology Major****Required:**

20.531	Primitive Social Organization	2
21.567	Population and Demography	2

Eight hours must be taken from the following courses:

21.548,	21.549	Criminology I, II	4
	21.550	Juvenile Delinquency	2
21.551,	21.552	Family and Marriage I, II	4
21.553,	21.554	Intergroup Relations I, II	4
	21.557	Urban Sociology	2
	21.558	Community Analysis	2
	21.560	Medical Sociology	2
	21.563	Social Gerontology	2
	21.570	Sociology of Occupations and Professions	2
	21.573	Sociology of Industry	2
	21.575	Sociology of Formal Organizations	2

Four hours must be taken from the following courses:

20.532	Primitive Religion	2
20.533	Acculturation	2
20.541	North American Indian	2
20.544	African Peoples and Culture	2
20.547	Latin American Peoples and Culture	2
		<b>44</b>
		<b>—</b>

**Elective Courses\*\***

	<b>Total Credits</b>	<b>28</b>
		<b>174</b>

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

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# law enforcement

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## PROGRAMS OF STUDY

### **Bachelor of Science Degree**

Major fields of study are offered in Law Enforcement, Security, and Correctional Practices. Students should choose their major field of study and their electives in consultation with a program adviser.

The distribution requirements, including certain required courses, are shown with each curriculum. Upon petition, students may be permitted under certain circumstances to substitute other courses which will more adequately serve their specific career objectives.

Each curriculum provides for not less than 174 quarter hours of work, including at least 40 quarter hours of advanced work in a major field.

No student transferring from another college or university is eligible to receive a degree until at least 40 quarter hours of academic work have been completed at Northeastern University immediately preceding graduation.

### **Associate in Science Degree**

The program leading to the Associate degree is offered for those who wish to obtain a general background in Law Enforcement, Security, or Correctional Practices but who do not wish to pursue a major field of concentration for the baccalaureate degree.

Candidates for the Associate in Science degree must complete a minimum of 96 quarter hours of credit. This is approximately one half of the requirements for the Bachelor of Science degree.

To provide a balanced program which will achieve the established objectives, the faculty has set a minimum credit requirement in the areas of study outlined on the following pages.

<b>CORRECTIONAL PRACTICES</b>		<b>Bachelor of Science Degree</b>	
		<b>quarter hours</b>	
<b>Basic Courses—required</b>			
10.501,	10.502,	10.503 Mathematics I, II, III	6
19.501,	19.502,	19.503 Psychology I, II, III	6
23.501,	23.502,	23.503 Western Civilization I, II, III	6
30.504,	30.505,	30.506 English I, II, III	6
30.507,	30.508,	30.509 Introduction to Literature I, II, III	6
39.501,	39.502,	39.503 Economic Principles and Problems I, II, III	6
			<b>36</b>
<b>Core Courses—required</b>			
	19.522	Psychology of Personality	2
	19.524,	19.525 Social Psychology I, II	4
19.541,	19.542,	19.543 Abnormal Psychology I, II, III	6
21.501,	21.502,	21.503 Sociology I, II, III	6
	21.534	Social Control	2
	21.547	Social Problems	2
	21.548,	21.549 Criminology I, II	4
	21.550	Juvenile Delinquency	2
	21.553,	21.554 Intergroup Relations I, II	4
	21.557	Urban Sociology	2
22.501,	22.502,	22.503 Principles of Political Science I, II, III	6
	22.513	American Constitutional Law	2
	22.514	Civil Rights	2
	22.516,	22.517 Public Administration I, II	4
23.504,	23.505,	23.506 U. S. History I, II, III	6
	45.511,	45.512 Human Relations in Personnel I, II	4
			<b>58</b>
<b>Major Concentration Courses—required</b>			
	94.501	Administration of Justice	2
	94.502	Criminal Law	2
	94.503,	94.504 Evidence and Court Procedure I, II	4
94.508,	94.509,	94.510 Criminal Investigation and Case Preparation I, II, III	6
94.525,	94.526,	94.527 Law Enforcement Identification and Records I, II, III	6
	94.532	Research Methods in Criminal Justice	2
	94.544	The American Correctional System	2
	94.546,	94.547 Social Deviance I, II	4
	94.549,	94.550 Treatment of Offenders I, II	4
94.551,	94.552,	94.553 Correctional Administration I, II, III	6
	94.557	Investigative Report Writing	2
	94.565	Seminar in Delinquency Prevention	2
94.567,	94.568,	94.569 Probation and Parole Practices I, II, III	6
94.574,	94.575,	94.576 Juvenile Corrections I, II, III	6
	94.593	Seminar in Correctional Program Management	2
			<b>56</b>
<b>Elective Courses*</b>			
			<b>24</b>
<b>Total Credits</b>			
			<b>174</b>

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

<b>CORRECTIONAL PRACTICES</b>			<b>Associate in Science Degree</b>
			<b>quarter hours</b>
<b>Basic Courses—required</b>			
19.501, 19.502, 19.503	Psychology I, II, III	6	
30.504, 30.505, 30.506	English I, II, III	6	12
		<u>—</u>	
<b>Core Courses—required</b>			
19.541, 19.542, 19.543	Abnormal Psychology I, II, III	6	
21.501, 21.502, 21.503	Sociology I, II, III	6	
	21.534 Social Control	2	
	21.547 Social Problems	2	
21.548, 21.549	Criminology I, II	4	
	21.550 Juvenile Delinquency	2	
21.553, 21.554	Intergroup Relations I, II	4	
	21.557 Urban Sociology	2	
	22.513 American Constitutional Law	2	
22.514	Civil Rights	2	32
		<u>—</u>	
<b>Major Concentration Courses—required</b>			
	94.501 Administration of Justice	2	
	94.502 Criminal Law	2	
	94.503, 94.504 Evidence and Court Procedure I, II	4	
94.525, 94.526, 94.527	Law Enforcement Identification and Records I, II, III	6	
	94.557 Investigative Report Writing	2	
	94.565 Seminar in Delinquency Prevention	2	
	94.546, 94.547 Social Deviance I, II	4	
	94.549, 94.550 Treatment of Offenders I, II	4	
94.551, 94.552, 94.553	Correctional Administration I, II, III	6	
	94.532 Research Methods in Criminal Justice	2	
94.574, 94.575, 94.576	Juvenile Corrections I, II, III	6	40
		<u>—</u>	
<b>Elective Courses*</b>			
		<b>Total Credits</b>	<b>96</b>
		<u>—</u>	

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

<b>LAW ENFORCEMENT</b>		<b>Bachelor of Science Degree</b>	
			<b>quarter hours</b>
<b>Basic Courses—required</b>			
10.501,	10.502,	10.503 Mathematics I, II, III	6
19.501,	19.502,	19.503 Psychology I, II, III	6
23.501,	23.502,	23.503 Western Civilization I, II, III	6
30.504,	30.505,	30.506 English I, II, III	6
30.507,	30.508,	30.509 Introduction to Literature I, II, III	6
39.501,	39.502,	39.503 Economic Principles and Problems I, II, III	6
			<b>36</b>
<b>Core Courses—required</b>			
	19.524,	19.525 Social Psychology I, II	4
19.541,	19.542,	19.543 Abnormal Psychology I, II, III	6
21.501,	21.502,	21.503 Sociology I, II, III	6
		21.534 Social Control	2
		21.547 Social Problems	2
	21.548,	21.549 Criminology I, II	4
		21.550 Juvenile Delinquency	2
	21.553,	21.554 Intergroup Relations I, II	4
		21.557 Urban Sociology	2
22.501,	22.502,	22.503 Principles of Political Science I, II, III	6
		22.513 American Constitutional Law	2
		22.514 Civil Rights	2
	22.516,	22.517 Public Administration I, II	4
23.504,	23.505,	23.506 U. S. History I, II, III	6
			<b>52</b>
<b>Major Concentration Courses—required</b>			
	94.501	Administration of Justice	2
	94.502	Criminal Law	2
	94.503,	94.504 Evidence and Court Procedure I, II	4
94.508,	94.509,	94.510 Criminal Investigation and Case Preparation I, II, III	6
	94.514,	94.515 Police Interrogation I, II	4
94.520,	94.521,	94.522 Traffic Law Enforcement I, II, III	6
94.525,	94.526,	94.527 Law Enforcement Identification and Records I, II, III	6
	94.530	Police Public Relations	2
	94.531	Police Community Relations	2
	94.532	Research Methods in Criminal Justice	2
	94.536,	94.537 Police Patrol I, II	4
	94.541,	94.542 Introduction to Criminalistics I, II	4
		94.557 Investigative Report Writing	2
		94.560 Police Supervision	2
		94.561 Police Juvenile Methods	2
		94.565 Seminar in Delinquency Prevention	2
94.571,	94.572,	94.573 Law Enforcement Management and Planning I, II, III	6
		94.590 Seminar in Law Enforcement	2
			<b>60</b>
<b>Elective Courses*</b>			<b>26</b>
		<b>Total Credits</b>	<b>174</b>

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

LAW ENFORCEMENT	Associate in Science Degree	
		quarter hours
<b>Basic Courses—required</b>		
19.501, 19.502, 19.503	Psychology I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
		<b>12</b>
<b>Core Courses—required</b>		
19.541, 19.542, 19.543	Abnormal Psychology I, II, III	6
21.501, 21.502,	21.503 Sociology I, II, III	6
	21.534 Social Control	2
	21.547 Social Problems	2
21.548,	21.549 Criminology I, II	4
	21.550 Juvenile Delinquency	2
21.553,	21.554 Intergroup Relations I, II	4
	21.557 Urban Sociology	2
	22.513 American Constitutional Law	2
	22.514 Civil Rights	2
		<b>32</b>
<b>Major Concentration Courses—required</b>		
	94.501 Administration of Justice	2
	94.502 Criminal Law	2
94.503,	94.504 Evidence and Court Procedure I, II	4
94.508, 94.509,	94.510 Criminal Investigation and Case Preparation I, II, III	6
	94.514, 94.515 Police Interrogation I, II	4
94.520,	94.521, 94.522 Traffic Law Enforcement I, II, III	6
	94.530 Police Public Relations	2
	94.531 Police Community Relations	2
	94.532 Research Methods in Criminal Justice	2
94.536,	94.537 Police Patrol I, II	4
94.541,	94.542 Introduction to Criminalistics I, II	4
	94.561 Police Juvenile Methods	2
		<b>40</b>
<b>Elective Courses*</b>		<b>12</b>
	<b>Total Credits</b>	<b>96</b>

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

**SECURITY****Bachelor of Science Degree**

			quarter hours
<b>Basic Courses—required</b>			
10.501, 10.502, 10.503	Mathematics I, II, III		6
19.501, 19.502, 19.503	Psychology I, II, III		6
23.501, 23.502, 23.503	Western Civilization I, II, III		6
30.504, 30.505, 30.506	English I, II, III		6
30.507, 30.508, 30.509	Introduction to Literature I, II, III		6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6	<b>36</b>
		<u>—</u>	
<b>Core Courses—required</b>			
	19.532	Industrial Psychology	2
21.501, 21.502, 21.503	Sociology I, II, III		6
	21.547	Social Problems	2
	21.548, 21.549	Criminology I, II	4
	22.513	American Constitutional Law	2
41.501, 41.502, 41.503	Accounting Principles I, II, III		6
44.501, 44.502, 44.503	Capital Institutions and Risk Management I, II, III		6
44.514, 44.515, 44.516	Property and Casualty Insurance I, II, III		6
45.501, 45.502, 45.503	Management and Organization I, II, III		6
	45.510	Labor Management Relations	2
	45.511, 45.512	Human Relations in Personnel I, II	4
	45.540	Industrial Safety	2
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6	<b>54</b>
		<u>—</u>	
<b>Major Concentration Courses—required</b>			
	94.501	Administration of Justice	2
	94.502	Criminal Law	2
	94.503, 94.504	Evidence and Court Procedure I, II	4
94.508, 94.509, 94.510	Criminal Investigation and Case Preparation I, II, III		6
	94.514, 94.515	Police Interrogation I, II	4
94.525, 94.526, 94.527	Law Enforcement Identification and Records I, II, III		6
	94.536, 94.537	Police Patrol I, II	4
	94.541, 94.542	Introduction to Criminalistics I, II	4
	94.557	Investigative Report Writing	2
	94.560	Police Supervision	2
94.571, 94.572, 94.573	Law Enforcement Management and Planning I, II, III		6
94.577, 94.578, 94.579	Government Security Programs I, II, III		6
	94.582	Document Control	2
	94.583	Industrial Fire Prevention	2
94.584, 94.585	Plant Protection I, II		4
	94.590	Seminar in Law Enforcement	2
		<u>—</u>	<b>58</b>
<b>Elective Courses*</b>			<b>26</b>
<b>Total Credits</b>			<b>174</b>

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

<b>SECURITY</b>		<b>Associate in Science Degree</b>
		quarter hours
<b>Basic Courses—required</b>		
19.501, 19.502, 19.503	Psychology I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
		<b>12</b>
<b>Core Courses—required</b>		
	19.532 Industrial Psychology	2
21.501, 21.502, 21.503	Sociology I, II, III	6
21.548,	21.549 Criminology I, II	4
45.501, 45.502,	45.503 Management and Organization I, II, III	6
	45.510 Labor Management Relations	2
45.511,	45.512 Human Relations in Personnel I, II	4
	45.540 Industrial Safety	2
45.570, 45.571,	45.572 Electronic Data Processing I, II, III	6
		<b>32</b>
<b>Major Concentration Courses—required</b>		
	94.501 Administration of Justice	2
	94.502 Criminal Law	2
94.503,	94.504 Evidence and Court Procedure I, II	4
94.508, 94.509,	94.510 Criminal Investigation and Case Preparation I, II, III	6
94.514,	94.515 Police Interrogation I, II	4
94.541,	94.542 Introduction to Criminalistics I, II	4
	94.557 Investigative Report Writing	2
94.577, 94.578,	94.579 Government Security Programs I, II, III	6
	94.582 Document Control	2
	94.583 Industrial Fire Prevention	2
94.584,	94.585 Plant Protection I, II	4
		<b>38</b>
<b>Elective Courses*</b>		
		<b>14</b>
<b>Total Credits</b>		
		<b>96</b>

\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses from any other curricula in the University College Catalog.

# **health-related programs**

- **forsyth school/northeastern university program for dental hygienists**
- **health care administration programs**
- **lincoln college/university college affiliated programs**

## **FORSYTH/NORTHEASTERN UNIVERSITY PROGRAM FOR DENTAL HYGIENISTS**

**Bachelor of Science Degree**

The Forsyth School for Dental Hygienists conducts a two-year day program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the Associate in Science degree from University College. After receiving their Associate in Science degree, students may complete the remaining Liberal Arts courses required for the Bachelor of Science degree given by University College.

		quarter hours
<b>Associate in Science Degree</b>		<b>96</b>
(Day program at Northeastern University and Forsyth School for Dental Hygienists)		
<b>Liberal Arts Courses</b>		
(Required through University College)		
10.501,    10.502,    10.503	Mathematics I, II, III	6
22.501,    22.502,    22.503	Principles of Political Science I, II, III	6
23.501,    23.502,    23.503	Western Civilization I, II, III	6
23.504,    23.505,    23.506	U. S. History I, II, III	6
26.501,    26.502,    26.503	Introduction to Philosophy I, II, III	6
30.507,    30.508,    30.509	Introduction to Literature I, II, III	6
39.501,    39.502,    39.503	Economic Principles and Problems I, II, III	6
Fine Arts:	Art, Music, or Theatre Arts	6
Literature:	English, American, or other in translation	54
<b>Elective Courses**</b>		24
<b>Total Credits</b>		<b>174</b>

\*\*While students may elect courses in their major field in excess of the minimum number required, they are encouraged to elect courses in a variety of fields beyond the major.

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## health care administration

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### Aims

Programs in Health Care Administration are offered through University College in order to help mature students improve their educational preparation for advancement and service in hospitals and other health agencies through part-time study.

In addition to offering courses in the liberal arts and in business administration, specialized courses for particular categories of health personnel are offered when such offerings are justified in terms of community and student need. The unique resources of the Boston area as a medical center offer excellent support facilities for these health-related programs.

In addition to technically oriented courses for health specialists, a core of courses is offered which is designed to provide all health workers with a foundation for improved interdisciplinary co-operation and communication.

**MANAGEMENT IN HEALTH AGENCIES AND INSTITUTIONS****Bachelor of Science Degree****quarter hours****Basic Courses—required**

10.501, 10.502, 10.503	Mathematics I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6
30.504, 30.505, 30.506	English I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6
		36
		—

**Core Courses—required***Liberal Arts*

18.311, 18.312, 18.313	General Biology and Laboratory I, II, III	12
18.324, 18.325, 18.326	Anatomy and Physiology I, II, III	6
	19.532 Industrial Psychology	2
21.501, 21.502, 21.503	Sociology I, II, III	6
22.501, 22.502, 22.503	Principles of Political Science I, II, III	6
26.501, 26.502, 26.503	Introduction to Philosophy I, II, III	6
Literature:	English, American, or other in translation	6
Fine Arts:	Art, Music, or Theatre Arts	6
		50
		—

*Management*

39.511, 39.512, 39.513	Statistics I, II, III	6
41.501, 41.502, 41.503	Accounting Principles I, II, III	6
44.507, 44.508, 44.509	Corporate Finance I, II, III	6
45.501, 45.502, 45.503	Management and Organization I, II, III	6
	45.510 Labor Management Relations	2
	45.511, 45.512 Human Relations in Personnel I, II	4
	45.513, 45.514 Personnel Management I, II	4
	45.554 Business Conference Techniques	2
45.570, 45.571, 45.572	Electronic Data Processing I, II, III	6
		42
		—

*Health Care Administration*

	86.501	Medical Terminology	2
	86.502	Hospital Laws and Ethics	2
86.504, 86.505, 86.506	Foundations of Medical Science I, II, III	6	
86.541, 86.542, 86.543	Medical Care I, II, III	6	

(continued on following page)

In addition to the courses listed above, each student will select one of the following sequences:

86.581, 86.582, 86.583	Hospital Organization and Management I, II, III or	}	6
86.571, 86.572, 86.573	Long-Term Care Administration I, II, III or		
86.521, 86.522	Public Health I, II		
86.511	Personal and Community Health		
			<b>22</b>
<b>Elective Courses</b>			
	Liberal Arts	6	
	Management	6	
	From Any Area	12	<b>24</b>
<b>Total Credits</b>			<b>174</b>



## NURSING HOME ADMINISTRATION

Recognizing the special needs of the nursing home administrator in a time of rapid change within our medical care system, University College has developed a progressive education plan in co-operation, and with the encouragement of, the Massachusetts Federation of Nursing Homes. Students within this program are considered to be candidates for the Bachelor of Science degree; however, in order to meet specific requirements for the professional and regulatory agencies, they may work toward an intermediate goal of a letter attesting to the completion of the following course sequence:

				quarter hours
<b>Required Courses:</b>				
19.501,	19.502,	19.503	Psychology I, II, III	6
		19.532	Industrial Psychology	2
	45.511,	45.512	Human Relations in Personnel I, II	4
45.501,	45.502,	45.503	Management and Organization I, II, III	6
41.501,	41.502,	41.503	Accounting Principles I, II, III	6
		86.501	Medical Terminology	2
		86.502	Hospital Law and Ethics	2
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6
86.571,	86.572,	86.573	Long-Term Care Administration I, II, III	6
<b>Total Credits</b>				<hr/> 40

It is understood that students who complete this sequence will ordinarily plan to complete the additional requirements for the Bachelor of Science degree in the Management in Health Agencies and Institutions curriculum (page 111). An additional optional goal would be to work toward the Associate in Science degree. Many of the credits in the above sequence would be applicable toward the Associate degree. Students considering this latter course should consult an adviser.

Completion of this sequence of courses and possession of the letter documenting this fact does not constitute graduation from University College.

Through the Center for Continuing Education, Northeastern offers a unique series of week-long residential institutes for nursing home administrators, which do not carry academic credit. For information about this program, contact the Center for Continuing Education at the University.

**MEDICAL RECORDS SCIENCE****Bachelor of Science Degree**

					quarter hours
<b>Basic Courses—required</b>					
10.501,	10.502,	10.503	Mathematics I, II, III		6
19.501,	19.502,	19.503	Psychology I, II, III		6
23.501,	23.502,	23.503	Western Civilization I, II, III		6
30.504,	30.505,	30.506	English I, II, III		6
30.507,	30.508,	30.509	Introduction to Literature I, II, III		6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6	<b>36</b>
					<u>—</u>
<b>Core Courses—required</b>					
<i>Liberal Arts</i>					
18.311,	18.312,	18.313	General Biology and Laboratory I, II, III	12	
18.324,	18.325,	18.326	Anatomy and Physiology I, II, III	6	
		19.532	Industrial Psychology	2	
21.501,	21.502,	21.503	Sociology I, II, III	6	
22.501,	22.502,	22.503	Principles of Political Science I, II, III	6	
26.501,	26.502,	26.503	Introduction to Philosophy I, II, III	6	
Literature:					6
Fine Arts:					6
			Art, Music, or Theatre Arts	—	<b>50</b>
<i>Management</i>					
39.511,	39.512,	39.513	Statistics I, II, III	6	
41.501,	41.502,	41.503	Accounting Principles I, II, III	6	
45.501,	45.502,	45.503	Management and Organization I, II, III	6	
	45.511,	45.512	Human Relations in Personnel I, II	4	
		45.554	Business Conference Techniques	2	
45.570,	45.571,	45.572	Electronic Data Processing I, II, III	6	<b>30</b>
					<u>—</u>
<i>Health Care Administration</i>					
		86.501	Medical Terminology	2	
		86.502	Hospital Law and Ethics	2	
86.504,	86.505,	86.506	Foundations of Medical Science I, II, III	6	
86.541,	86.542,	86.543	Medical Care I, II, III	6	<b>16</b>
					<u>—</u>
<b>Major Concentration Courses—required</b>					
86.551,	86.552,	86.553	Organization of the Medical Records Department I, II, III	6	
86.554,	86.555,	86.556	Medical Records Science I, II, III	12	
	86.557,	86.558	Medical Records Science IV, V	8	
					<u>—</u>
<b>Elective Courses</b>					<b>26</b>
	<i>Liberal Arts</i>				6
	From Any Area				10
<b>Total Credits</b>					<b>16</b>
(continued on following page)					<b>174</b>

In addition to completing the academic requirements, candidates for a degree with a major in Medical Records Science must also complete a minimum of 500 clock hours of supervised practice experience in affiliated hospitals. This experience is coordinated with the course work in the major field.

Candidates who wish to major in this program must be interviewed by the Assistant Director, Medical Records Science program. Arrangements for this interview may be made through the University College Office. No candidate will be considered as matriculated until this requirement has been met.



**MEDICAL RECORDS SCIENCE****Certification Program**

Candidates who wish to qualify for admission to the professional examination for registration as a record librarian (R.R.L.), and who already hold a bachelor's degree in another field from a college or university acceptable to Northeastern, may undertake the following course work. Successful completion of this course sequence with a cumulative quality point average of 2.00 will lead to certification from University College that the candidate has completed a professional program in Medical Records Science.

**Courses required for Professional Certification:**

		quarter hours
18.324,    18.325,    18.326	Anatomy and Physiology I, II, III	6
45.501,    45.502,    45.503	Management and Organization I, II, III	6
86.501	Medical Terminology	2
86.502	Hospital Law and Ethics	2
86.504,    86.505,    86.506	Foundations of Medical Science I, II, III	6
86.554,    86.555,    86.556	Medical Records Science I, II, III	12
86.557,    86.558	Medical Records Science IV, V	8
86.551,    86.552,    86.553	Organization of the Medical Records Department I, II, III	6
	One course in Statistics	2
	One course in Principles of Electronic Data Processing	2
	<b>Total Credits</b>	<b>52</b>

In addition to completion of the academic requirements, candidates for certification must complete a minimum of 500 clock hours of supervised practice experience in affiliated hospitals. This experience is coordinated with the course work in the major field.

Candidates who wish to matriculate in this program must be interviewed by the Assistant Director, Medical Records Science program. Arrangements for this interview may be made through the University College Office. No candidate will be considered as matriculated until this requirement has been met.

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# **lincoln college/university college**

## **affiliated programs**

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### **Science Technology Related Program**

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of chemistry and biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory applications and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical, and hospital laboratories dealing with analytical, production, and research functions and in secondary school education in the teaching of general science, chemistry, biology, and other related subjects. The Chemical-Biological Technology program leads to the Bachelor of Science degree from University College.

### **Allied-Medical Technology Related Programs**

A program in Cytotechnology is offered through the co-operating efforts of Lincoln College and University College and conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The program leads to the Bachelor of Science degree, which is awarded by University College, and certification of registration by the American Society of Clinical Pathologists.

Cytotechnology is a specialty in the broader field of medical technology. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine requiring a technician with not only highly specialized laboratory training but a sound academic background.

The program in Medical Technology is a joint Lincoln College—University College program which is conducted in affiliation with several hospital schools of medical technology approved by the American Medical Association. The program leads to the Bachelor of Science degree, which is awarded by University College, and entitles the student to take the registration examination of the American Society of Clinical Pathologists.

The medical technologist is a most respected and important member of the paramedical team. He works as a professional in close association with pathologists, doctors and hospital and medical laboratory personnel. Performing in a variety of specialized fields such as bacteriology, histology, biochemistry, and nuclear and radiochemistry, the medical technologist performs chemical tests, and morphologically and biochemically identifies bacteria. He makes important observations necessary for critical diagnosis by the doctor for early detection and treatment of diseases.

**CHEMICAL-BIOLOGICAL TECHNOLOGY****Bachelor of Science Degree**

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301, 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311,	10.312 Algebra I, II	4
10.313,	10.314 Trigonometry I, II	4
	10.315 Introduction to Calculus	4
12.314,	12.315, 12.316 General Chemistry and Laboratory I, II, III	9
30.504,	30.505, 30.506 English I, II, III	6

**SECOND YEAR**

10.321,	10.322,	10.323 Calculus I, II, III or	6
39.511,	39.512,	39.513 Statistics I, II, III	
12.321,	12.322,	12.323 Analytical Chemistry I, II, III	6
12.324,	12.325,	12.326 Analytical Chemistry Laboratory I, II, III	6
23.501,	23.502,	23.503 Western Civilization I, II, III	6

**THIRD YEAR**

11.304,	11.305,	11.306 General Physics I, II, III	6
18.311,	18.312,	18.313 General Biology and Laboratory I, II, III	12
30.507,	30.508,	30.509 Introduction to Literature I, II, III	6

**FOURTH YEAR**

12.331,	12.332,	12.333 Organic Chemistry I, II, III	6
12.334,	12.335,	12.336 Organic Chemistry Laboratory I, II, III	6
18.314,	18.315,	18.316 Botany I, II, III	9
39.501,	39.502,	39.503 Economic Principles and Problems I, II, III	6

**FIFTH YEAR**

12.351,	12.352,	12.353 Instrumental and Radio-Chemistry I, II, III	6
18.321,	18.322,	18.323 Microbiology and Laboratory I, II, III	12
		*Elective	6

**SIXTH YEAR**

18.324,	18.325,	18.326 Anatomy and Physiology I, II, III	6
18.351,	18.352,	18.353 Histology-Organology I, II, III	6
21.501,	21.502,	21.503 Sociology I, II, III	6
		*Elective	6

**SEVENTH YEAR**

16.531,	16.532,	16.533 Oceanography I, II, and Marine Geology	6
18.357,	18.358,	18.359 Genetics I, II, III	6
19.501,	19.502,	19.503 Psychology I, II, III	6
		*Elective	6

\*General Science Teacher Option—Students planning to apply to the Northeastern University Graduate School of Education must include courses in Adolescent Psychology and Principles of Teaching among the electives.

**CYTOTECHNOLOGY****Bachelor of Science Degree**

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301, 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311, 10.312	Algebra I, II	4
10.313, 10.314	Trigonometry I, II	4
	10.315 Introduction to Calculus	4
12.314, 12.315, 30.504, 30.505	12.316 General Chemistry and Laboratory I, II, III	9
	English I, II, III	6

**SECOND YEAR**

10.321, 10.322, 10.323	Calculus I, II, III or	6
39.511, 39.512, 39.513	Statistics I, II, III	
18.311, 18.312, 18.313	General Biology and Laboratory I, II, III	12
39.501, 39.502, 39.503	Economic Principles and Problems I, II, III	6

**THIRD YEAR**

11.304, 11.305, 11.306	General Physics I, II, III	6
12.331, 12.332, 12.333	Organic Chemistry I, II, III	6
12.334, 12.335, 12.336	Organic Chemistry Laboratory I, II, III	6
19.501, 19.502, 19.503	Psychology I, II, III	6

**FOURTH YEAR**

12.321, 12.322, 12.323	Analytical Chemistry I, II, III	6
12.324, 12.325, 12.326	Analytical Chemistry Laboratory I, II, III	6
18.324, 18.325, 18.326	Anatomy and Physiology I, II, III	6
23.501, 23.502, 23.503	Western Civilization I, II, III	6

**FIFTH YEAR**

18.351, 18.352, 18.353	Histology-Organology I, II, III	6
86.501	Medical Terminology	
86.502	Hospital Law and Ethics	
18.391	Photomicroscopy or	6

86.504, 86.505, 86.506 Foundations of Medical Science I, II, III

6 Months' AMA-approved Hospital School of Cytotechnology and 6 Months' Internship—(Student will take Registry Examination at the end of hospital training period before academic credit for hospital school phase is officially granted). 15

**SIXTH YEAR**

18.321, 18.322, 18.323	Microbiology and Laboratory I, II, III	12
18.341, 18.342, 18.343	Hematology I, II, III	6
	Elective (Non-Science)	6

**SEVENTH YEAR**

17.311, 17.312, 17.313	Clinical Biochemistry I, II, III	6
30.507, 30.508, 30.509	Introduction to Literature I, II, III	6
	Elective (Non-Science)	6
	Elective	6

**MEDICAL TECHNOLOGY****Bachelor of Science Degree**

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or Introductory Mathematics I and II (10.301, 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311,	Algebra I, II	4
10.313,	Trigonometry I, II	4
	10.315 Introduction to Calculus	4
12.314,	General Chemistry and Laboratory I, II, III	9
30.504,	English I, II, III	6

**SECOND YEAR**

10.321,	10.322,	10.323	Calculus I, II, III or	6
39.511,	39.512,	39.513	Statistics I, II, III	
12.321,	12.322,	12.323	Analytical Chemistry I, II, III	6
12.324,	12.325,	12.326	Analytical Chemistry Laboratory I, II, III	6
39.501,	39.502,	39.503	Economic Principles and Problems I, II, III	6

**THIRD YEAR**

12.331,	12.332,	12.333	Organic Chemistry I, II, III	6
12.334,	12.335,	12.336	Organic Chemistry Laboratory I, II, III	6
18.311,	18.312,	18.313	General Biology and Laboratory I, II, III	12

**FOURTH YEAR**

11.304,	11.305,	11.306	General Physics I, II, III	6
18.321,	18.322,	18.323	Microbiology and Laboratory I, II, III	12
23.501,	23.502,	23.503	Western Civilization I, II, III	6

**FIFTH YEAR**

12.351,	12.352,	12.353	Instrumental and Radiochemistry I, II, III	6
30.507,	30.508,	30.509	Introduction to Literature I, II, III	6
73.311,	73.312,	73.313	Clinical Biochemistry	6
*Elective				6

**SIXTH YEAR**

12 Months' Internship at an A.M.A.-approved Hospital School of Medical Technology	30
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**SEVENTH YEAR**

18.341,	18.342,	18.343	Hematology I, II, III	6
19.501,	19.502,	19.503	Psychology I, II, III	6
*Elective (Non-Science)				6
*Elective (Science)				6

\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

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# course descriptions

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## Abbreviations

Q. H. = Quarter Hours (credit earned)

Cl. = Hours required in class per week

Prereq. = Prerequisite

## 10—MATHEMATICS

Students enrolling in Mathematics (10.501) will be given a diagnostic test during the first meeting of class. The purpose of this test is to determine whether the student's preparation in mathematics is sufficient to enable him to do the work required in this course. If his score indicates that he falls below the minimum level required, he will be given information about obtaining additional preparation from the Center for Programmed Study, which is located in the Dodge Library.

**10.501, 10.502, 10.503 Mathematics I, II, III** 6 Q. H.

Methods and applications of algebra; graphical techniques; exponents and logarithms; interest, time payments, and investment; introduction to statistics and probability. A diagnostic test is given to identify students with inadequate preparation for this course.

**10.504, 10.505, 10.506 Mathematics for Scientific Business Management I, II, III** Prereq. 10.503; 6 Q. H.

Concepts of mathematics underlying operations research, emphasizing applications to business management. Symbolic logic, set theory, tree diagrams, probability, elementary vector and matrix algebra, stochastic processes, decisions under uncertainty, linear programming, game theory.

**10.511 Mathematics, the Computer, and Society I** 2 Q. H.

A non-technical survey of the main ideas of mathematics. An introduction to basic ideas and concepts of geometry, arithmetic, and algebra, with emphasis on patterns of mathematical reasoning and the development of mathematics as a part of our cultural heritage.

**10.512 Mathematics, the Computer, and Society II** 2 Q. H.

An introduction to the history, design, construction, and operation of digital computers. Specific mathematical techniques appropriate for computers. Introduction to analog computers and methods.

**10.513 Mathematics, the Computer, and Society III** 2 Q. H.

A study of the impact of mathematics and the computer on our society of today and tomorrow. New directions in science and technology; economics, government, and industry; and the "New Mathematics" of our primary and secondary schools.

**10.521, 10.522, 10.523 Introduction to Calculus and Analytic Geometry I, II, III** Prereq. 10.503 or equiv.; 6 Q. H.  
 A first course in calculus and analytic geometry, with applications drawn from a number of fields: functions, graphs, and limits; derivatives, elementary differential equations, applications of the derivative; conics; exponential and logarithmic functions, integrals.

**10.524, 10.525, 10.526 Intermediate Calculus and Analytic Geometry I, II, III** Prereq. 10.523 or equiv.; 6 Q. H.  
 Further topics in calculus and analytic geometry for students who have had an introduction to the subject. Inverse trigonometric and hyperbolic functions, polar coordinates, solid analytic geometry, spherical and cylindrical coordinates, partial derivatives, partial differential equations, multiple and line integrals, sequences, series, l'Hospital's rule, improper integrals, Taylor's formula.

**10.541, 10.542, 10.543 Introduction to Probability and Statistics I, II, III** Prereq. 10.503; 6 Q. H.  
 An introductory course in the structure and applications of probability and statistics. Sample spaces, fundamental computation rules, hypergeometric, binomial, poisson, and normal distributions; law of large numbers, random variables, stochastic processes. Sampling, statistical parameters, statistical inference and significance tests, correlation and regression, variance analysis.

## 11—PHYSICS

**\*11.304 General Physics I** Prereq. None; 2 Cl., 2 Q. H.  
 Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion; conservation laws of energy and momentum.

**11.305 General Physics II** Prereq. 11.304; 2 Cl., 2 Q. H.  
 Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems.

**11.306 General Physics III** Prereq. 11.305; 2 Cl.; 2 Q. H.  
 Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits.

## 12—CHEMISTRY

**12.301 Introductory Chemistry** Prereq. None; 2 Cl.; Non-credit  
 A non-mathematical approach to the concepts of chemistry including matter, elements, compounds, chemical bonding, chemical equations, the periodic system, solutions and molecular structure.

**12.311 General Chemistry I** Prereq. None; 2 Cl.; 2 Q. H.  
 Fundamental ideas of matter and energy; properties of gases, liquids and solids; atomic structure; chemical bonding and valence; classification of the

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(\*Non-credit for Engineering Technology students.)

elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes; chemical equilibrium.

**12.312 General Chemistry II** Prereq. 12.311; 2 Cl.; 2 Q. H.  
Ionic reactions and ionic equilibrium; oxidation-reduction reactions; electrochemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of metals and non-metals; study of families of elements in the Periodic System.

**12.313 General Chemistry III** Prereq. 12.312; 2 Cl.; 2 Q. H.  
Chemistry of related and similar metals; coordination compounds; chemistry of organic compounds, both open and closed-chain compounds; organic chemistry of natural and synthetic products, including petroleum, rubber, synthetic resins, plastics, etc.

## 16—NATURAL SCIENCE

**16.501, 16.502, 16.503 Natural Science I, II, III** 6 Q. H.  
The universe and the solar system; the earth from an astronomical, geological, and meteorological viewpoint; the nature of matter and energy. The elements of physics and chemistry and their applications to everyday life; the basic theory of atomic energy; the more recent developments in atomic research. A brief review of the history of biology precedes a study of the cell and the essential life processes. Examples of the plant and animal kingdoms, with particular emphasis on those organisms which have a direct effect on man; the flowering plants, ecology, and conservation. The various human systems, with emphasis on physiology rather than anatomy; contributions of medicine; genetics and evolution.

**16.511, 16.512, 16.513 History of Science and Technology I, II, III** Prereq. 16.503 or equiv.; 6 Q. H.  
An analysis of the varieties of cultures and civilizations from primitive man to the present. Particular emphasis on the inter-relationships of science, technology, and society. Classes will incorporate an independent study-seminar technique, drawing upon the training, experience, and interest of each student. The first term will cover primitive man to the Roman Empire; the second, the Roman Empire to Sir Isaac Newton; and the third, Sir Isaac Newton to the present.

**16.521 Introduction to Geology** Prereq. 16.503 or equiv.; 2 Q. H.  
Introduction to fundamental concepts of the earth and its crust. Consideration of the nature and properties of the materials composing the earth; the areal distribution of these materials, and the processes by which they are formed, altered, transported, and deposited; and the nature and development of the landscape.

**16.522 Economic Mineralogy** Prereq. 16.503 or equiv.; 2 Q. H.  
Introduction to the geological occurrence, mineralogy, use, and economics of the more important metallic and non-metallic minerals in the world today. International mineral problems will be discussed.

**16.523 Gemology** Prereq. 16.503 or equiv.; 2 Q. H.  
Introduction to the precious and semiprecious minerals of the earth's crust. Techniques of gem cutting, polishing, and faceting will be discussed in detail. Opportunity will be available to view and handle actual gem stones.

**16.531 Oceanography I** Prereq. 16.503 or equiv.; 2 Q. H.  
An introduction to the geology of the ocean basins and the physical and chemical properties of sea water. The development of ocean currents and their effect on the land masses of the world.

**16.532 Oceanography II** Prereq. 16.531; 2 Q. H.  
The habitat zones and organisms of the sea. Phytoplankton, zooplankton, and nekton are discussed. The growing economic importance of marine resources for the expanding world population.

**16.533 Marine Geology** Prereq. 16.503 or equiv.; 2 Q. H.  
Physiography and structure of ocean basins. Marine geological processes and features including sedimentation, erosion, shorelines, and bottom topography. Methods and techniques of marine geological exploration.

**16.534 Fisheries Oceanography I** Prereq. 16.503 or equiv.; 2 Q. H.  
Survey of commercially important marine organisms. An introduction to life histories and distribution of commercially important seaweed, shellfish, and fishes. Population dynamics and fishery potential of the world's oceans. An analysis of fishery stocks and sea farming.

**16.535 Fisheries Oceanography II** Prereq. 16.503 or equiv.; 2 Q. H.  
Commercial fishing methods, techniques, and equipment. Methods of harvesting the seas from past to present. An analysis of the various fisheries of the Atlantic Ocean with their equipment. Latest techniques of electric and photic fish capture.

**16.536 Fisheries Oceanography III** Prereq. 16.503 or equiv.; 2 Q. H.  
Commercial fishery products and their exploitation. A study of the commercial products and applications of marine organisms such as sea weed, fish, and shellfish. Particular emphasis on the marine products of commerce from the New England area. Chemical, industrial, and dietary applications of marine products.

**16.541 Meteorology I** Prereq. 16.503 or equiv.; 2 Q. H.  
Introduction to the structure, composition and phenomena of the atmosphere. Consideration of solar radiation, aurora, airglow, meteors and radio propagation in the upper atmosphere, followed by a detailed examination of the major weather elements, related measuring instruments and global wind circulation of the troposphere. Laboratory exercises include plotting horizontal and vertical variations in temperature, pressure and moisture, with analysis of the dynamic inter-relationships involved.

**16.542 Meteorology II** Prereq. 16.541; 2 Q. H.  
Study of secondary wind circulation, air masses, frontal systems, thunderstorms, hurricanes and tornadoes. Techniques in local short-range and regional long-range forecasting, with special attention to New England conditions. Laboratory exercises in synoptic weather maps preparation, analysis and interpretation.

**16.543 Climatology**

Prereq. 16.503 or equiv.; 2 Q. H.

Classification, analysis and geographic distribution of climatic types. Consideration of microclimates and relationship of weather and climatic elements to other factors in the natural environment and human activities. Opportunity provided to apply effects of these elements to a chosen area of personal interest.

## 18—BIOLOGY

**18.311 General Biology and Laboratory I**

Prereq. None; 3 Cl.; 3 Lab.; 4 Q. H.  
Fundamental concepts and fields of biology. Physical, chemical, biological characteristics and behavior of protoplasm and cells. Plant and animal histology.

**18.312 General Biology and Laboratory II**

Prereq. 18.311; 3 Cl.; 3 Lab.; 4 Q. H.  
Plant and animal metabolism, maintenance of internal environment, gametogenesis and cell division.

**18.313 General Biology and**

**Laboratory III** Prereq. 18.312; 3 Cl.; 3 Lab.; 4 Q. H.  
Fundamentals of genetics and eugenics; embryology; plant life history.

**18.321 Microbiology I**

Prereq. 18.313; 2 Cl.; 4 Lab.; 4 Q. H.  
Biology of microorganisms and bacteria, preparation of media, sterilization, staining, isolation, and identification of pure cultures.

**18.322 Microbiology II**

Prereq. 18.321; 2 Cl.; 4 Lab.; 4 Q. H.  
Bacteriology of water, sewage, air, and milk. Standards, plate counts, and physiological tests.

**18.323 Microbiology III**

Prereq. 18.322; 2 Cl.; 4 Lab.; 4 Q. H.

Intermediary metabolism.

**18.324 Anatomy and Physiology I**

Prereq. 18.313; 1 Cl.; 3 Lab.; 2 Q. H.

The structure and function of vertebrate organ systems.

**18.325 Anatomy and Physiology II**

Prereq. 18.324; 1 Cl.; 3 Lab.; 2 Q. H.

Introduction to cellular metabolism.

**18.326 Anatomy and Physiology III**

Prereq. 18.325; 1 Cl.; 3 Lab.; 2 Q. H.

Continuation of the study of cellular metabolism.

## 19—PSYCHOLOGY

**19.501, 19.502, 19.503 Psychology I, II, III**

6 Q. H.

An introductory survey of the general field of psychology. The first term will cover the historical backgrounds of psychology, experimental design and research in psychology, growth and development, psychological testing, and the measurement of intelligence. The second term will include the physiological basis of behavior, motivation and emotion, sensation and perception, and social psychology. The third-term topics include learning, problem-solving, cognition, and the study of normal and abnormal personalities.

**19.504, 19.505, 19.506 Statistics in Psychology I, II, III**

Prereq. 19.503; 6 Q. H.

Scales of measurement, graphs, measures of central tendency, variability, and correlation. Probability, statistical distributions, and parametric and non-parametric tests of significance, including chi square, t-test, F test and simple analysis of variance.

**NOTE:** May not be taken in addition to Statistics (39.511, 39.512, 39.513), which may be substituted.

**19.511, 19.512, 19.513 Child and Adolescent Psychology I, II, III**

Prereq. 19.503; 6 Q. H.

Detailed exploration of the processes of growth and development from infancy through adolescence. Consideration of such topics as sensory and motor development, social development and peer group relations, intelligence, language, thought, and personality.

**19.521 Personality I**

Prereq. 19.503; 2 Q. H.

Systematic study of the normal personality. A number of prominent theoretical approaches to personality will be considered including the psychoanalytic, constitutional, field and stimulus-response.

**19.522 Personality II**

Prereq. 19.521; 2 Q. H.

Problems of adjustment, frustration, conflict, and stress. Adjustive behavior, mechanisms of defense, and minor personality maladjustments will be considered.

**19.523 Motivation**

Prereq. 19.522; 2 Q. H.

Survey of the various aspects of motivation. Such areas as primary and secondary reinforcement, unconscious motivation, effectance motivation, and the assessment of motive will be considered.

**19.524, 19.525 Social Psychology I, II**

Prereq. 19.503; 4 Q. H.

An analysis of the behavior of the individual in social contexts. Topics considered include the nature and measurement of attitudes, language and communication, group membership and structure, leadership, crowd behavior, and social movements.

**19.531 Psychological Testing**

Prereq. 19.506; 2 Q. H.

Basic principles of test theory, test administration, and test construction. Familiarization with representative types of tests.

**19.532 Introduction to Industrial Psychology**

Prereq. 19.503; 2 Q. H.

Psychological techniques in the selection and placement of employees; use of psychological tests in industry; and the evaluation of the human factors leading to optimal working efficiency and job satisfaction.

**19.541, 19.542, 19.543 Abnormal Psychology I, II, III**

Prereq. 19.503; 6 Q. H.

Study of the abnormal personality, etiology, dynamics, and symptomatology of the neuroses and psychoses; psychosomatic, psychopathic, and organic disorders; psychotherapy.

**19.551, 19.552, 19.553 Experimental Psychology I, II, III**

Prereq. 19.506; 9 Q. H.

The methods and techniques for the design, execution, and interpretation of psychological experiments. Laboratory instrumentation and research methodology in the investigation of the sensory processes, perceptual-motor behavior, motivation and learning. 2 class hours plus 2 laboratory hours.

**19.561, 19.562, 19.563 Historical Development of**

**Psychology I, II, III** Prereq. two full-year courses in Psychology; 6 Q. H. The historical development of psychology from its philosophical beginnings to the twentieth century. Major schools of psychology which have influenced the development of modern psychology including structuralism, functionalism, behaviorism, Gestalt psychology, and psychoanalysis. The role of theory in current psychological research.

**19.571 Seminar in Psychology**

Prereq. 19.553; 2 Q. H.

Discussion of current problems in psychology.

**20—ANTHROPOLOGY****20.501 Introduction to Physical Anthropology and Archaeology**

Prereq. 21.503; 2 Q. H.

An intensive introduction to the elements of physical anthropology, covering such subjects as the primates, fossil man and evolution, archaeology, problems of heredity and genetics, and problems of race and racial classification.

**20.502, 20.503 Cultural Anthropology I, II** Prereq. 20.501; 2 Q. H.  
An intensive introduction to cultural anthropology covering the nature of culture, methods and theories, characteristic features of the language, family life, rituals, and values of tribal peoples in different parts of the world.

**20.511. Introduction to Anthropological Field Techniques** Prereq. 21.503; 2 Q. H.  
The collection of empirical data in the field, participant-observation techniques, and use of personal documents.

**20.521 Culture and Personality** Prereq. 20.503; 2 Q. H.  
A cultural approach integrating concepts of social role, values, personality and socialization, and linguistic considerations.

**20.531 Primitive Social Organization** Prereq. 20.503; 2 Q. H.  
The institutions of primitive societies; comparative approaches and functional explanations of a limited number of societies; the dynamics of continuity and change of culture and social organization.

**20.532 Primitive Religion** Prereq. 20.503; 2 Q. H.  
A study of religious beliefs and rituals of tribal peoples in many parts of the world, including the origin of religious behavior, the relationship of religious behavior to other aspects of culture, and the psychological factors involved.

**20.533 Acculturation** Prereq. 20.503; 2 Q. H.  
An examination of the processes of acculturation in culture contact situations of tribal and non-tribal peoples. Focus is on the role of the individual, and the concepts of personality and values in relation to this process.

**20.537 Anthropological Theory** Prereq. 20.503; 2 Q. H.  
A history of major orientations, emphasizing the principal contemporary orientations in the field. Evolutionary approaches, culture area and historical analysis, functionalism, role structure, comparative methods, social relations approaches, and the theory of cognitive structure.

**20.541 North American Indian** Prereq. 20.503; 2 Q. H.  
Prehistory of the North American Indian, including the study of aboriginal culture areas, utilizing a comparative analysis of representative Indian tribes and their cultures as the method of study. Family life, religion, warfare patterns, and political organization are described.

**20.544 African Peoples and Cultures** Prereq. 20.503; 2 Q. H.  
African geography, prehistory and cultures; the spectrum of cultures ranging from the Pygmy to the Ashanti Federation; the family, lineage, clan and tribe as these relate to problems of political and economic change in contemporary Africa.

**20.547 Latin American Peoples and Cultures** Prereq. 20.503; 2 Q. H.  
Tribal social systems, traditional values, and institutions of Latin America with particular emphasis on Hispanic America.

## 21—SOCIOLOGY

**21.501, 21.502, 21.503 Sociology I, II, II** Prerequisite to all other Sociology courses. Prereq. 30.506; 6 Q. H.

Basic concept and theories relating to the study of man as a participant in group life with emphasis on social structure, socialization, social stratification, collective behavior, population, and the major institutional areas.

**21.512 Introduction to Social Research Methods I** Prereq. 20.511; 2 Q. H.

The nature of measurement in sociology and an analysis of the following methods: interviewing, participant observation, content analysis, questionnaire construction, scaling, demographic analysis, design of experiments.

**21.513 Introduction to Social Research Methods II** Prereq. 21.512; 2 Q. H.

Sampling techniques, experimental design, theory of data; design and execution of individual research projects.

**21.517 Foundations of Sociological Theory** Prereq. 21.503; 2 Q. H.

An historical survey of sociological theorists including the work of de Tocqueville, Comte, Marx, Durkheim, Cooley, and others.

**21.518 Contemporary Sociological Theory I** Prereq. 21.517; 2 Q. H.

A study of major theoretical issues in sociology. Discussion concentrates on systematic questions and topics, as opposed to particular theorists, but material is drawn from theorists such as Weber, Simmel, Thomas, Mannheim, Merton, and Parsons.

**21.519 Contemporary Sociological Theory II** Prereq. 21.518; 2 Q. H.

A seminar in which the principal focus will be upon questions of theoretical interest, e.g., the problem of order, the problem of change, the role of the individual in change. Students will present their papers in class.

**21.528 Social Stratification** Prereq. 21.503; 2 Q. H.

A comparative study of the nature of class structure with emphasis on the United States and with reference to India and England. Discussion of such topics as theories of class structure, factors determining class membership, differential class behavior, and social mobility.

**21.531 Social Change** Prereq. 21.503; 2 Q. H.

An analysis of the changing patterns in social and economic institutions, a discussion of modern social trends, and a review of current literature in the field.

**21.534 Social Control** Prereq. 21.503; 2 Q. H.

The study of group membership as a determinant of behavior; analysis of status and role, patterns of authority, and group ideology as factors in the evaluation of conduct.

**21.538, 21.539, 21.540 Introduction to Social Welfare I, II, III**

Prereq. 21.503, 20.503; 6 Q. H.

History, philosophy, theory, and social welfare institutions including the following fields: family and child welfare, aging, mental health, corrections, public assistance, social insurances, and school and military social work.

**21.543, 21.544, 21.545 Introduction to Social Work Practice I, II, III**

Prereq. 21.540; 6 Q. H.

During the first quarter, the profession of social work is described. In the remaining quarters, a practicum of 4 hours per week in a social agency runs concurrently with class work devoted to discussion of practicum experiences.

**21.547 Social Problems**

Prereq. 21.503; 2 Q. H.

An overview of contemporary American social problems and the application of sociological concepts, methods, and principles to these problems.

**21.548, 21.549 Criminology I, II**

Prereq. 21.503; 4 Q. H.

Analysis of the patterns of criminal behavior, the causes of crime, and the relationship between law and crime.

**21.550 Juvenile Delinquency**

Prereq. 21.503; 2 Q. H.

A study of factors in delinquency and an examination of the implications for prevention, rehabilitation, and treatment.

**21.551, 21.552 Family and Marriage I, II**

Prereq. 21.503; 4 Q. H.

A comparative and historical treatment. The backgrounds of contemporary problems are discussed in the context of the functions, forms, and processes of this institution.

**21.553, 21.554 Intergroup Relations I, II**

Prereq. 21.503; 4 Q. H.

A study of the relationships between various racial, nationality, cultural, and religious groups with emphasis on historical development. Particular attention will be paid to American society with its specific problems of adjustment and assimilation.

**21.557 Urban Sociology**

Prereq. 21.503; 2 Q. H.

An analysis of the various causes, characteristics, and effects of urbanization in several different cultures of the world. Specific attention is given to the problems of urban and suburban living and the changing structure of the city.

**21.558 Community Analysis**

Prereq. 21.503; 2 Q. H.

Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of community study methods. Contrasts between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

**21.560 Medical Sociology**

Prereq. 21.503; 2 Q. H.

Sociological concepts and research relating to the study of patterns of behavior in the areas of health and disease. Emphasis on the family, community, medical organizations, class and status, as social subsystems related to the field of health.

**21.563 Social Gerontology**

Prereq. 21.503; 2 Q. H.

An examination of social factors involved in aging, with specific reference to how biological and psychological age changes influence behavior, social roles and cultural patterns. The relation of aging to social change, and special provisions for the aged.

**21.567 Population and Demography**

Prereq. 21.503; 2 Q. H.

The use of demographic methods in the analysis of social structures. Introduction to the use of population size and composition, birth rates, and other demographic data in the comparative analysis of societies.

**21.570 Sociology of Occupations and Professions** Prereq. 21.503; 2 Q. H.

The meanings of work. Division of labor and specialization. Analysis of the social relations within an occupation and among occupational groups. Analysis of occupational structure and of institutional aspects of an occupation, such as recruitment, training, career patterns and preferences. Relationships of supervisors, peers, colleagues, subordinates and clientele; their significance for work role behavior. Professionalization.

**21.573 Sociology of Industry**

Prereq. 21.503; 2 Q. H.

Comparison of pre-industrial and industrial society. The impact of industry on society; relationship between industry, culture, and values. The interrelationship between different occupations within a given work organization such as the factory, office, or restaurant. Diversification and specialization. Human relations in industry; analysis of subordinate-superordinate behavior, line and staff relationships, and of formal and informal groups.

**21.575 Sociology of Formal Organizations**

Prereq. 21.503; 2 Q. H.

A study of formal organizations and the principles that govern organizational life. Weber's theory of bureaucracy and the concept of authority; communication systems and other conceptions of formal organizations. The structure of work groups and their effect on the larger organization. The social content of organizations.

**22—POLITICAL SCIENCE****22.501, 22.502, 22.503 Principles of Political Science I, II, III** 6 Q. H.

An analysis of the concepts and basic structure of political institutions from Greece to the emergence of the modern nation-state. A comparative analysis of the structure and functions of totalitarian and constitutional systems in the contemporary world. A study of the international community including an introduction to international politics and American foreign policy.

**22.504 Introduction to Political Theory**

Prereq. 22.503; 2 Q. H.

Development of the political ideas of the Western world. The major philosophers of Greece, Rome, the Christian Era, and the Renaissance.

**22.505 Contemporary Political Theory**

Prereq. 22.504; 2 Q. H.

Political ideas and systems of political thought from Machiavelli to the present.

**22.506 American Political Thought**

Prereq. 22.503; 2 Q. H.

Political thought from the colonial period to the present including a study of the impact of religious, economic, and judicial theory on the structure of American ideas.

**22.511 American National Government**

Prereq. 22.503; 2 Q. H.

A study of the form and structure of the federal constitution and an analysis of the legislative process at the national level.

**22.512 Urban and Metropolitan Government** Prereq. 22.503; 2 Q. H.  
The political, structural, and functional problems of an urbanizing United States, including an analysis of urban, suburban, and metropolitan governments.

**22.513 Political Parties and Pressure Groups** Prereq. 22.503; 2 Q. H.  
Party government in the United States and Great Britain. A contrasting study focusing on the interaction of party and government.

**22.514 American Constitutional Law** 2 Q. H.  
A case analysis of the development of federalism, the separation of powers, and the role of the federal and state courts in constitutional development.

**22.515 Civil Rights** 2 Q. H.  
An evaluation of the quality and content of civil liberties in the United States. Emphasis will be placed on the first, fifth, sixth, fourteenth, and fifteenth amendments to the Constitution.

**22.516 Public Administration I** 2 Q. H.  
An introduction to the theory, forms and processes of administration at the national and state level.

**22.517 Public Administration II** Prereq. 22.516; 2 Q. H.  
Selected problems. Case-study approach to examination of relation between the theory and practice of public administration.

**22.518 Government and Politics of the States** 2 Q. H.  
A study of state and local government and problems and the function and operational responses to them.

**22.521 Comparative Government I** Prereq. 22.503; 2 Q. H.  
A comparative analysis of the structure and functions of the governments of Great Britain and the USSR.

**22.522 Comparative Government II** Prereq. 22.521; 2 Q. H.  
A comparative analysis of the structure and functions of the governments of France and Western Germany.

**22.523 Government and Politics of Latin America** 2 Q. H.  
Political behavior, economic institutions, and social environment of selected Latin American states are examined against the background of the continuing influence of the United States in this region.

**22.524 Government and Politics of the Middle East** 2 Q. H.  
A study of political change, economic growth, and social adaptation in selected countries of the Middle East. The role of the Middle East in world affairs, especially its ties with Northern Africa.

**22.525 Government and Politics of the Far East** 2 Q. H.  
Governmental systems, economic institutions, and social environment of the states of East Asia (China, Japan, Korea, Taiwan) are studied with reference to the special influence of Communist China in this region.

**22.526 Government and Politics of Africa** 2 Q. H.  
 Government systems, political parties, socio-economic problems, and foreign policies are studied with reference to Africa's role in the international community.

**22.527 Communism in Eastern Europe** 2 Q. H.  
 The communist political systems of eastern Europe and their socio-economic environments are studied in respect to their relationship with USSR.

**22.531 International Relations** Prereq. 22.503; 2 Q. H.  
 Elements and limitations on national power. Contemporary world politics. Problems of cold and hot war.

**22.532 International Organization** Prereq. 22.503; 2 Q. H.  
 Development of international organizations with special emphasis on the United Nations, specialized agencies, and regional organizations.

**22.533 American Foreign Policy** Prereq. 22.503; 2 Q. H.  
 Formulation and conduct of American foreign policy. Role of the United States in world affairs since 1945.

**22.534 Soviet Foreign Policy** 2 Q. H.  
 A study of the evolution of Soviet foreign policy since 1917 with emphasis on the development of the international communist movement.

## 23—HISTORY

**23.501 Western Civilization I** 2 Q. H.  
 The beginnings of Western civilization with emphasis on the political, economic and social history of the ancient and medieval world.

**23.502 Western Civilization II** 2 Q. H.  
 Modern Europe to 1815 with an examination of the two major intellectual movements—the Renaissance and the Enlightenment—and their impact upon religious movements, economic developments, and the rise of national states.

**23.503 Western Civilization III** 2 Q. H.  
 Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace.

**23.504 United States, 1783–1845** 2 Q. H.  
 The United States from the close of the Revolution to the annexation of Texas, with primary attention to the political institutions and policies of the new Republic.

**23.505 United States, 1845–1900** 2 Q. H.  
 The rise of sectional controversy in America, the Civil War, and the economic development of the nation after the war.

**23.506 United States since 1900** 2 Q. H.  
 The United States in an age of urbanized industrialism and international crisis.

**23.521 Ancient Middle East** 2 Q. H.  
A study of ancient cultures including Sumer, Babylonia, Egypt and Israel.

**23.522 Ancient Greece** 2 Q. H.  
The origins and development of Greek civilization, with special emphasis on the political evolution of Hellenistic society.

**23.523 Ancient Rome** 2 Q. H.  
Roman civilization in ancient times, with special emphasis on the rise of the Republic and the decline of the Empire.

**23.524 Early Middle Ages** 2 Q. H.  
Europe from the decline of the Roman Empire to 1215, with emphasis on the role of religion in medieval society and the fashioning of political and economic institutions of feudalism and manorialism.

**23.525 Late Middle Ages** 2 Q. H.  
The medieval period from 1215 to 1500, with emphasis on the rebirth of classicism in literature and the arts.

**23.526 Early Modern Europe** 2 Q. H.  
The political, economic, and social history of Europe from the dawn of the modern age to the Glorious Revolution.

**23.527 England, 500–1603** 2 Q. H.  
England to the coming of the Stuarts, with an account of political, religious, and social developments.

**23.541 Europe, 1688–1789** 2 Q. H.  
Europe from the Glorious Revolution to the French Revolution, with emphasis on the impact of the Enlightenment.

**23.542 Europe, 1789–1870** 2 Q. H.  
Europe from the French Revolution to the Franco-Prussian War, with a stress on the struggles for liberalism and nationalism.

**23.543 Europe, 1870–1914** 2 Q. H.  
The background of World War I with an emphasis on the roles of nationalism, militarism, imperialism, and the European alliance system.

**23.544 Europe, 1914–1939** 2 Q. H.  
Europe from World War I to World War II, emphasizing the failures of peacemakers at Versailles and the subsequent rise of aggressive autocracies in Italy and Germany.

**23.545 Europe since 1939** 2 Q. H.  
World War II and its aftermath, with emphasis on the Cold War and attempts by European nations to unify the continent.

**23.548 England, 1603–1815** 2 Q. H.  
England in the Stuart and Hanover age, with emphasis on the victory of parliamentary institutions over the monarchy.

**23.549 England since 1815** 2 Q. H.  
The democratization of English life in the nineteenth and twentieth centuries, with emphasis on changing imperial and international relations.

**23.552 English Constitutional History to 1485** 2 Q. H.  
The development of the English constitution from Anglo-Saxon roots to the coming of the Tudors, with emphasis on local as well as central government.

**23.553 English Constitutional History since 1485** 2 Q. H.  
The victory of Parliament over the King and the subsequent democratization of England's governmental institutions and processes.

**23.554 France since 1815** 2 Q. H.  
France after Napoleon, emphasizing the continuing attempt by the French people to find satisfactory political institutions.

**23.555 Germany since 1815** 2 Q. H.  
An analysis of the role of nationalism in German life after 1815, with emphasis on unification, militarism, and imperialism.

**23.556 Italy since 1815** 2 Q. H.  
The unification of Italy, the attempt to establish constitutional monarchy, the rise of Fascism after World War I, and the movement toward democratic republicanism after World War II.

**23.561 Colonial America to 1689** 2 Q. H.  
The exploration and settlement of North America, with emphasis on the establishment of political, social, and economic institutions.

**23.562 Colonial America, 1689–1763** 2 Q. H.  
North America in an age of international rivalry for the continent.

**23.563 American Revolution and Constitution** 2 Q. H.  
America's quest for independence from England and the efforts to establish governments in the new republic.

**23.564 Topics in American Constitutional History to 1900** 2 Q. H.  
Selected topics in the development of the American Constitution during the nineteenth century, with primary emphasis on federalism and the relations of governments and the economy.

**23.565 Topics in Twentieth-Century American Constitutional History** 2 Q. H.  
Topics include the conflict between the liberal and conservative attitudes toward the role of government in the economy and the role of the Supreme Court in the struggle for civil liberties and rights.

**23.566 United States since 1933** 2 Q. H.  
American society in a period of depression, war, and postwar crisis at home and abroad.

**23.567 Topics in American Diplomatic History** 2 Q. H.  
Selected topics in the history of American foreign policy from 1789 to the present.

**23.568 Topics in American Social History** 2 Q. H.  
Selected topics in the history of the American people since 1789.

**23.569 Topics in American Economic History** 2 Q. H.  
Selected topics in the development of the capitalist economy in America since 1789, with emphasis on the role of government.

**23.581 Latin America to 1826** 2 Q. H.  
The fusing of Indian, Iberian, and Negro cultures in Latin America, and the quest for political independence.

**23.582 Latin America, 1826–1920** 2 Q. H.  
The attempts by Latin Americans to establish democratic, stable societies, and the foreign relations of Latin American nations, especially with the United States.

**23.583 Contemporary Latin America** 2 Q. H.  
The struggles of Latin Americans for political, economic, and social development since 1920.

**23.584 The Far East before 1850** 2 Q. H.  
The history of China, Japan and other Asiatic places prior to their opening by the West in the mid-nineteenth century.

**23.585 China since 1850** 2 Q. H.  
A century of China's history with emphasis on the Western impact on Chinese civilization, China's struggle to maintain independence, and the victory of communism in the twentieth century.

**23.586 Japan since 1850** 2 Q. H.  
An analysis of Japanese domestic developments and foreign relations since the mid-nineteenth century, with emphasis on the Japanese quest for territory and power, World War II, and the post-war epoch.

**23.588 Africa North of Sahara** 2 Q. H.  
North Africa to the present, with primary emphasis on the European impact on the area, and the subsequent movement for political independence and economic development.

**23.589 Africa South of Sahara** 2 Q. H.  
A companion to course 23.588, with primary emphasis on the rise and decline of imperialism in the area.

**23.591 Modern Middle East** 2 Q. H.  
The Middle East since 1914, emphasizing Zionism, Pan Arabism, the effects of two world wars, and the post-war settlements.

**23.592 India and Pakistan** 2 Q. H.  
The political and religious history of the people who formed India and Pakistan, with an account of internal developments and foreign relations since independence.

**23.593 Southeast Asia** 2 Q. H.  
The cultures of the peoples of Southeast Asia, with an examination of the impact of European nations upon them and an account of their quest for national identity and economic development.

<b>23.594 Russia, 1450–1801</b>	2 Q. H.
The emergence of Russia as a recognized European power, with an account of westernization and expansion in the eighteenth century.	
<b>23.595 Russia, 1801–1917</b>	2 Q. H.
The history of the Russian people and their government from the days of Czar Alexander I to the revolutions of 1917.	
<b>23.596 Russia since 1917</b>	2 Q. H.
The revolutions of 1917 and the subsequent history of the Russian people and their government, with special emphasis on foreign relations.	

## **26—PHILOSOPHY**

<b>26.501, 26.502, 26.503 Introduction to Philosophy I, II, III</b>	6 Q. H.
An examination of the aims, functions, and methods of philosophy in comparison with other areas of human knowledge and valuation. The first quarter deals with the methods of philosophy and with the important issues which have arisen from a philosophical analysis of man's beliefs and values. The second quarter deals with theoretical and practical moral problems. The nature of morality, the various kinds of moral judgments, and some types of ethical theories are discussed. The third quarter critically compares various conceptions of the ultimate meaning of human existence. Discussion of the views of major philosophical schools on life, mind, freedom, and God. Concludes with the function and benefits of philosophical thinking.	
<b>26.504, 26.505, 26.506 Ancient and Modern Philosophy I, II, III</b>	6 Q. H.
Development of western philosophical thought and its influence from the seventh century, B.C., to the twentieth century, A.D. Particular attention will be given to Plato and Aristotle in the ancient period and to Descartes, Locke, Hume, and Kant in the modern period.	
<b>26.507, 26.508, 26.509 History of Recent Philosophy I, II, III</b>	Prereq. 26.503; 6 Q. H.
Philosophic trends in the nineteenth century considered as a background for the understanding of ideas influential in the twentieth century. Critical analysis and discussion of contemporary philosophical trends as represented by idealism, analytic philosophy, logical positivism, naturalism, and existentialism. Ayer, Carnap, Dewey, Lewis, Maritain, Moore, Sartre, Schlick are representative thinkers.	
<b>26.511, 26.512, 26.513 Philosophy of Art I, II, III</b>	6 Q. H.
The nature, status, and function of art and beauty in their various forms in life. The relationship between the artistic-aesthetic and other human values and activities. Contrast between the practical, intellectual, and aesthetic impulse and attitude. Classical theories concerning art and the aesthetic experience. The problems of taste, standards of criticism, and objectivity of the aesthetic judgment. The arts, the artist, and society.	
<b>26.521, 26.522, 26.523 Philosophy of Religion I, II, III</b>	6 Q. H.
A philosophical evaluation of religious experience and beliefs about the nature of God, the origin and the function of religion, and the major religious	

traditions. This course considers major problems such as natural and moral evil, the soul, immortality, miracles, prayer, and religious knowledge.

**26.524, 26.525, 26.526 Great Eastern Religions I, II, III** 6 Q. H.

Introduction to religion. Survey of terms, primitive religious development, and subsequent evolution into the sophisticated forms of the great eastern religions. Egyptian and Babylonian religions, Confucianism, Taoism, Hinduism, Buddhism, and Shintoism will be discussed.

**26.527, 26.528, 26.529 Great Western Religions I, II, III** 6 Q. H.

An introductory study to the historical, theological, and philosophical development of the great western religions, taken within their social contexts. Religions to be studied will include Zoroastrianism, Judaism, Christianity, Islam, and contemporary religious phenomena.

**26.531, 26.532, 26.533 Ethics I, II, III** 6 Q. H.

Introduction to ethical theory and its relation to concrete moral decisions. Stresses such moral problems as egoism and altruism, the meaning of good and evil, conscience, obligation and human freedom, and implications of modern psychological and sociological theories about men and society. Critical evaluation and discussion of some of the major ethical theories. The relations of ethical thought to religion, social philosophy, art, and science. Various texts in ethics will be read, and discussions will concern both texts and current ethical problems.

**26.534 Logic** 2 Q. H.

The art of correct thinking and effective discourse, enabling the student to analyze types of argument or discourse and to detect fallacies resulting from semantic confusion and methodological error. Exercises in the structure and logical relations of propositions, types of deductive reasoning, and other thought processes used to obtain clear verbalization. Nature of truth, proof, and their relationship to validity. The functions and relationships of deduction and induction, formal, and factual reasoning.

**26.541, 26.542, 26.543 Social Philosophy I, II, III** 6 Q. H.

Critical examination of the leading socio-political ideologies in regard to their conceptions of the character, structure, and function of society. Emphasis upon a normative approach to the principles, means, and goals which underlie these major conceptions. Main emphasis upon movements in modern era and thinkers such as Hobbes, Locke, Hegel, Mill, Marx, Lenin, Toynbee, and Whitehead.

## 27—FINE ARTS

**27.501 Introduction to the Arts** 2 Q. H.

Introduction to the techniques and meanings of various artistic expressions. The stylistic, aesthetic and social factors of painting, sculpture, drawing, architecture and graphic arts are studied in detail. The major stress of the course is on the visual arts.

**27.504, 27.505, 27.506 Survey of Western Art I, II, III** 6 Q. H.

A history of Western art, painting, sculpture, and architecture from prehistoric times to the twentieth century.

**27.507 Ancient Architecture** 2 Q. H.  
Developments in the builder's art from prehistoric times to the end of the Classical Era, with emphasis on building methods, materials, and styles as they developed.

**27.508 Medieval and Renaissance Architecture** 2 Q. H.  
A continuation of Ancient Architecture, this course includes a study of architecture from the Early Christian Period through the Renaissance.

**27.509 European Architecture** 2 Q. H.  
A continuation of Medieval and Renaissance Architecture, this course deals with developments in the seventeenth, eighteenth, and nineteenth centuries, and those influences which have given rise to the leading styles of today.

**27.511 History of Ancient Art** 2 Q. H.  
The materials and techniques of ancient artisans in architecture, sculpture, and painting. Includes a survey of prehistoric art, and the arts of ancient Egypt, Mesopotamia, Crete and Greece.

**27.512 History of Medieval Art** 2 Q. H.  
Beginning with a study of ancient Rome and its people, the course includes a study of Roman art and architecture, Early Christian art, Christian symbolism, Byzantine art, Romanesque, and Gothic.

**27.513 Italian Renaissance Art** 2 Q. H.  
Beginning with a study of Early Renaissance architecture and sculpture, then concentrating on Early Renaissance painting. The course traces the development of Italian art from the time of Brunelleschi, Ghiberti, and Giotto to the age of Leonardo Da Vinci. The study of the High Renaissance includes painting, architecture and sculpture. The works of Michelangelo, Raphael and the Venetian school are studied in detail.

**27.514 European Art** 2 Q. H.  
Traces the stylistic, social, technical, and historical development of painting, sculpture, and architecture from the late sixteenth century up to the end of the nineteenth century Romantic Period in Northern and Western Europe. The artistic expressions of El Greco, Brueghel, La Tour, Rubens, Frans Hals, Rembrandt, Velasquez, Poussin, Watteau, David, and others are studied in detail.

**27.515 Modern Painting** 2 Q. H.  
The development of painting from nineteenth-century Romanticism to the present day. Includes a detailed examination of the social, technical and philosophical factors involved in the various schools of painting in contemporary American and European art. Emphasis is placed upon the works of French Impressionists, Post Impressionists, German Expressionists, Realists, Surrealists, and contemporary Abstraction. The works of Van Gogh, Gauguin, Seurat, Picasso, Braque, Miro, Kirchner, Munch, Klee and Kandinsky are studied in detail. Includes museum and art gallery visits and lectures.

**27.521 Spanish Art** 2 Q. H.  
The study of Spanish art and painting from the Gothic to the nineteenth century including the work of such major painters as El Greco, Velasquez, Goya, and Zurbaran.

**27.522 French Art**

2 Q. H.

A detailed study of French painting and sculpture from the Renaissance period to the nineteenth century. Emphasis is placed upon the styles, technique and design of the work of such major figures in French art history as Poussin, Watteau, David, Delacroix, and Ingres.

**27.523 English Art**

2 Q. H.

English painting and sculpture from the Gothic to the nineteenth century. The works of the major figures in English art, such as Hogarth, Gainsborough, Reynolds, Turner, and Blake, are studied in detail.

**27.524, 27.525, 27.526 History of American Art I, II, III**

6 Q. H.

The development of American art from Colonial times to the present. The object of this course is to acquaint the student with the rise of architecture, sculpture, and painting in America. Lectures include discussion of techniques, styles, methods, and materials employed during the periods considered.

**27.530 Byzantine Art**

2 Q. H.

A study of architecture, painting, mosaics, and the minor arts of the Byzantine world from the fourth century through the middle of the fifteenth century.

**27.531, 27.532, 27.533 Oriental Art I, II, III**

6 Q. H.

The major styles, techniques, and designs in the painting, sculpture, architecture, ceramics, and graphic arts of the Far East. The philosophical and religious influences which affect subject matter and style will be related to the works of art in the major historical periods of India, China, Korea, and Japan.

**27.534 Russian Art**

2 Q. H.

A survey of Russian art from ancient Russia to the present. The influence of Byzantine art on early Russian painting and architecture, the effect of Westernization on art in St. Petersburg, painting of the nineteenth and early twentieth centuries, and the effect of the concept of socialist realism on modern Russian art.

**27.535 African Art**

2 Q. H.

Various stylistic characteristics of sculpture and other artistic expressions of the major cultures of Africa from the thirteenth to the twentieth century.

**27.536 Latin American Art**

2 Q. H.

Pre-Columbian and post-Columbian art forms of Latin America. Architecture, sculpture, painting, and the decorative arts are considered.

**27.541, 27.542, 27.543 Drawing I, II, III**

9 Q. H.

Practice in the techniques and development of drawing in various media. Detailed study of anatomy.

**27.544 Graphic Arts—Woodcutting**

3 Q. H.

Creative expression in the techniques of woodcuts and printing. Study of western and oriental woodcut prints.

**27.545 Graphic Arts—Etching**

3 Q. H.

Practice and creative expression in process of etching and printing techniques. Technical study of etching in the history of art.

<b>27.546 Graphic Arts—Lithography</b>	3 Q. H.
Creative expression in the techniques of lithography and printing.	
<b>27.551, 27.552, 27.553 Painting—Basic Level I, II, III</b>	9 Q. H.
Practice and creative expression in the technical fundamentals of figure and landscape painting.	
<b>27.554 Painting—Advanced Level</b>	3 Q. H.
Painting with concentration upon the development of personal expression and style.	
<b>27.561, 27.562, 27.563 Basic Color and Design I, II, III</b>	9 Q. H.
Study and practice of the principles of design and science of color.	
<b>27.564 Advanced Color and Design</b>	3 Q. H.
Creative expression in various color and design problems.	
<b>27.571, 27.572, 27.573 Basic Commercial Design I, II, III</b>	9 Q. H.
Study and creative work in layout, illustration, advertising and typography.	
<b>27.574 Advanced Commercial Design</b>	3 Q. H.
Creative design problems in illustration and advertising.	
<b>27.577, 27.578, 27.579 Stained Glass Design I, II, III</b>	9 Q. H.
Expression in the process of glass design. Study of the history of stained glass.	
<b>27.581 Basic Sculpture</b>	3 Q. H.
Fundamentals of techniques in sculpture and the casting process.	
<b>27.584, 27.585 Ceramics I, II</b>	6 Q. H.
Basic course in the techniques and practice of ceramics.	
<b>27.591 Art Seminar</b>	2 Q. H.
Specific techniques, problems, and theories in art. Students will be responsible for research projects and papers.	

## 28—MUSIC

<b>28.501 Introduction to Music</b>	2 Q. H.
The principal concern is to teach the student a technique for listening actively to music. The course surveys and analyzes works by J. S. Bach, Mozart, Beethoven, Wagner, Stravinsky, and others.	
<b>28.502 Fundamentals of Music</b>	2 Q. H.
Music notation. Symbols of pitch representation and time values. Intervals as the basis of all scales and chord structures. The church modes, tonality, contemporary scales, organization of materials. Music reading skills and music dictation to train the ear.	
<b>28.511 History of Music</b>	2 Q. H.
The men, ideas, and events that have dominated music history from ancient times through the Renaissance, Baroque, Classical and Romantic eras to our own day. Composers to be studied include Palestrina, Bach, Mozart, Beethoven, Wagner, Mahler and Stravinsky.	

**28.512 Music before 1750** Prereq. 28.501; 2 Q. H.  
 The evolution of music from the Gregorian chant to Bach. Discussion of organum, the church modes, the music of the troubadours, the motets and madrigals of des Prez, Lassus, and Palestrina, as well as the English madrigalists, concluding with Handel, Scarlatti, and Bach.

**28.513 Music of the Classical Era** Prereq. 28.501; 2 Q. H.  
 A study of the period in music history extending from Bach to Beethoven characterized by the perfection of great forms such as the symphony and the concerto. Principal emphasis will be on the works of Mozart and Haydn with continuing reference back to the Bachs, who helped form the period, and forward to Beethoven, whose Romantic inclinations helped to end the period.

**28.514 Aspects of Romantic Music** Prereq. 28.501; 2 Q. H.  
 Musical styles of the nineteenth century. Classicism and Romanticism. A detailed study of romantic realism (program music) and romantic idealism (personal expression) that followed Beethoven. Composers to be studied will include Tchaikovsky, Brahms, Wagner, Liszt, Berlioz, Mahler, and others.

**28.515 Contemporary Music** Prereq. 28.501; 2 Q. H.  
 Contemporary music and its techniques seen as a mirror of our time. Major composers studied include Stravinsky, Debussy, Ravel, Bartok, Prokofiev, Hindemith, Milhaud, and Schoenberg.

**28.521 The Symphony** 2 Q. H.  
 A thorough study of the symphonies of Haydn, Mozart, Beethoven, Berlioz, Brahms, Dvorak, and Tchaikovsky. Aesthetic tone of the period and philosophical outlook of the composer are examined as they affect the structure and meaning of the music.

**28.522 The Concerto** 2 Q. H.  
 The evolution of the concerto from its origins in the Baroque Period to its use in our time. Concertos for every instrument are studied, including piano, cello, violin, horn, organ, and bassoon. Composers studied include Vivaldi, Bach, Mozart, Beethoven, Brahms, Schumann, Rachmaninoff, Mendelssohn, and Tchaikovsky.

**28.523 Great Literature for the Piano** 2 Q. H.  
 The study of pianoforte music written in the nineteenth and early twentieth centuries by masters such as Beethoven, Chopin, Schumann, Liszt, Debussy, and Ravel. The course will analyze the source of power and expressiveness generated in the sonatas and concerti of Beethoven; nocturnes and ballades of Chopin; and preludes of Debussy.

**28.524 The World of Opera** 2 Q. H.  
 Distinctions will be made between music drama and the number opera. Students will be required to acquire librettos. Aria, recitative, ensemble and other basic elements of opera will be isolated and discussed. Analyses of complete operas will be made.

**28.525 The World of Musical Comedy** 2 Q. H.  
 An historical survey and analytic study of musical shows from "The Black Crook" to "My Fair Lady" and "West Side Story." Major works by Romberg,

Kern, Gershwin, Rodgers and Hammerstein, Lerner and Loewe, Bernstein, and others will be studied.

**28.526 Jazz: Evolution and Essence** 2 Q. H.

The many roots of jazz and its development from the worksong and the vocal blues to the avant-garde experiments of today. Contributions of the major performers: soloists, arrangers, composers. The problems of "on-the-spot" creativity and personal expressions; the "beat"; multiplicity of accents.

**28.531 Life and Works of J. S. Bach** 2 Q. H.

A comprehensive survey of the music and background of J. S. Bach with four areas of concentration: Bach and the figured bass; the young Bach (Baroque Romanticism); Bach, the churchman; Bach, the secular composer.

**28.532 Life and Works of Mozart** 2 Q. H.

The growth of Mozart from child prodigy to master composer. His mastery in all fields of music with particular emphasis on his development of the symphony and his achievements in opera. The man, as seen through his letters, as performer and composer; his humor and earthiness.

**28.533 Life and Works of Beethoven** 2 Q. H.

An analysis of the complex personality and art of this supreme musical genius. His relation to the turbulent times in which he lived; his role as the great transition figure in the passage from Classicism to Romanticism. His psychological and aesthetic growth will be observed by studying similar forms written in different periods of his life.

## 29—SPEECH AND THEATRE ARTS

**29.501 Effective Speaking I** 2 Q. H.

Selection and organization of speech materials, essentials of good platform delivery, individual and class criticism of both prepared and impromptu speeches. A practical course devoted to developing an ability to speak easily, naturally and forcefully.

**29.502 Effective Speaking II** Prereq. 29.501; 2 Q. H.

This course builds upon the techniques and principles developed in Effective Speaking I by stressing increased student proficiency. Speech organization and delivery of more complex materials with which the student is likely to be confronted in business, industry, or the professions will be studied.

**29.503 Effective Speaking III** Prereq. 29.502; 2 Q. H.

Speech as related to practical aspects of business, industry, and the professions. The role of speech in a democracy. Group interaction in the formulation of ideas. The individual speaker as part of a group. The role of discussion in problem analysis, problem solving, and policy making. The principles and methods of organizing and participating in group discussions. Parliamentary procedure.

**29.504 Voice and Articulation** 2 Q. H.

A practical course aimed at developing vocal flexibility; theory of vocal mechanism; treatment of individual voice and articulation problems.

**29.511 Introduction to Theatre Arts**

2 Q. H.

A course aimed at developing in theatregoers an appreciation of the total theatre experience, by studying the roles played by the artists and craftsmen of the theatre in bringing the playwright's script to life. The role of the director, actors, and designers. The role of the audience as critics.

**29.521 Introduction to Dramatic Literature**

2 Q. H.

The relationship between drama as literature and as theatre. Types of drama; comedy, tragedy, melodrama, farce and drawing-room comedy. The dramatist's attitude and his style: Classicism, Romanticism, Realism, Naturalism, and Theatricalism.

**29.522 Masters of the Theatre I**

2 Q. H.

The plays in relationship to their times, the theatre in which they were performed, and the dramatic theory of the age. A study is made of the plays of Aeschylus, Sophocles, Aristophanes, Plautus, Terence, and Seneca. Also studied are plays of the Medieval religious theatre of England, France, and Spain. Medieval secular drama (farce, interlude, folk plays) are discussed, as are the contributions of Jonson, Marlowe, Dekker, and Shakespeare.

**29.523 Masters of the Theatre II**

2 Q. H.

The art of the Italian commedia dell'arte, the Neoclassic theatre of Racine, Moliere, and Dryden, the Restoration theatre, and the plays of Goldsmith and Sheridan.

**29.524 Modern European Drama**

2 Q. H.

An examination of European drama of the late nineteenth century and of the twentieth century reflecting the changing views toward the nature of man and the techniques of theatre. Among the playwrights to be studied are Ibsen, Strindberg, Chekhov, Pirandello, Lorca, Brecht, and the Absurdists.

**29.525 Modern British Drama**

2 Q. H.

The drama of England and Ireland of the twentieth century, reflecting the impact of modern life upon modern theatre. Representative dramatists to be studied are Galsworthy, Barrie, Shaw, O'Casey, Coward, Osborne, and Pinter.

**29.526 Modern American Drama**

2 Q. H.

A view of American drama from 1900 to the present time. The American playwright reflecting the social, philosophical, and psychological temper. Among the playwrights to be studied are O'Neill, Anderson, Sherwood, Odets, Hellman, Williams, Miller, and Albee.

**29.531 Contemporary Film**

2 Q. H.

A survey of world film from the days of Edison's experiments to the present. Evaluation and critical review of representative films. Viewing of outstanding films.

**29.541 Workshop for the Actor I**

2 Q. H.

Physical preparation. Basic stage movement and deportment; the control of the stage voice; the analysis and establishment of characterization through observation and awareness of the body; improvisations and short scenes.

**29.542 Workshop for the Actor II**

Prereq. 29.541; 2 Q. H.

Psychological preparation. The analysis and establishment of characterization through memory, emotion, imagination, and recall. Analysis of specific roles; the creation of a character analysis book; improvisations and short scenes.

**29.543 Workshop for the Actor III**

Prereq. 29.542 2 Q. H.

Preparing and performing the role. The physical and psychological preparation of specific roles. Short classroom scenes; the presentation of a one-act play.



## 30—ENGLISH

Students enrolling in English (30.504) will be given a diagnostic test during the first meeting of class. The purpose of this test is to determine whether the student's level of preparation in English is sufficient to enable him to do the work required in the course. If his score indicates that he falls below the minimum level required, he will be given information about obtaining additional preparation from the Center for Programmed Study which is located in the Dodge Library.

**30.501, 30.502, 30.503 English**

for International Students I, II, III

Prereq. None; 2 Cl.; Non-credit

An intensive review of the basic mechanics of English grammar and punctuation. Reading essays for understanding. Both oral and written reports dealing with subjects related to American life. Writing business and social correspondence.

**30.504, 30.505, 30.506 English I, II, III**

6 Q. H.

Review of grammar and punctuation through drill. A study of the techniques of exposition, description, argumentation, narration, and documentation; frequent theme assignments to develop skill in writing; related readings.

**30.507, 30.508, 30.509 Introduction to Literature I, II, III**

Prereq. 30.506; 6 Q. H.

Short stories, plays, poems, and the novel. Writing of short critique papers.

**30.511, 30.512, 30.513 Business Writing and Reports I, II, III**

6 Q. H.

Detailed study of the business letter and other forms of writing required of the trained man in business, with special emphasis on vocabulary improvement and efficiency of communication. Analysis of the different types of business and semitechnical reports, format, and documentation. Illustrated lectures on research techniques and reference sources. The preparation of reports.

**30.514, 30.515, 30.516 Technical Writing I, II, III**

Prereq. 30.506 or equiv.; 6 Q. H.

Development of technical writing, editing, and graphic arts. Types of technical documentation, including proposals, reports, handbooks, parts lists, information retrieval, programmed instruction, and reproduction processes. Emphasis on practice in technical writing and preparation of graphic aids.

**30.517 Intermediate Writing**

Prereq. 30.506; 2 Q. H.

Practice in expository and imaginative writing in a variety of forms, designed to help the student discover his own style. Individual attention to the student's work.

**30.518, 30.519 Creative Writing I, II**

Prereq. 30.517; 4 Q.H.

A workshop in writing, analyzing, and editing short fiction. Assignments in varied styles and techniques are read in class, and problems of the author or the audience are discussed.

**30.521 The English Language**

Prereq. 30.506, 30.509 or equiv.; 2 Q. H.

An introduction to the scientific study of the nature of the English language. The backgrounds and historical development of the language are studied

through sounds, grammar, and usage. The problem of meaning and symbolic nature of language are discussed.

**30.522 Introduction to Semantics** Prereq. 30.506, 30.509 or equiv.; 2 Q. H.  
The ways in which language habits affect thinking processes and raise problems in social relationships. Meaning as communicated through language.

**30.531 Western World Literature I** 2 Q. H.  
Major works of Greek literature, including Homer, the Greek tragedians, and Plato.

**30.532 Western World Literature II** 2 Q. H.  
Biblical and early Medieval literatures, and their influence on present-day thought and writing.

**30.533 Western World Literature III** 2 Q. H.  
European Renaissance literature, including Dante, Montaigne, and Cervantes.

**30.534 Western World Literature IV** 2 Q. H.  
The Neoclassic period in France and England, from Corneille to "The Fables" of La Fontaine.

**30.535 Western World Literature V** 2 Q. H.  
A study of the influence of such eighteenth-century writers as Voltaire and Rousseau on comparatively modern literature.

**30.536 Western World Literature VI** 2 Q. H.  
Celebrated poets and novelists of the nineteenth century in Europe, emphasizing their influence on the writers of England and America.

**30.541 English Literature I** 2 Q. H.  
A survey of major figures of early English literature, from the Anglo-Saxon period through the seventeenth century.

**30.542 English Literature II** 2 Q. H.  
English literature from the eighteenth-century satirists (Swift and Pope) to the early nineteenth-century romantics (Keats and Lamb).

**30.543 English Literature III** 2 Q. H.  
English literature from the mid-nineteenth-century essayists through the leading English writers of the twentieth century.

**30.544 American Literature I** 2 Q. H.  
American literature from Colonial times to the beginnings of the short story. The works of Bryant, Cooper, Irving, and Hawthorne will be emphasized.

**30.545 American Literature II** 2 Q. H.  
American literature from the triumph of the transcendentalist movement in New England to the period immediately preceding the Civil War. The works of Emerson, Thoreau, Poe, Longfellow, Holmes, Melville, and Whitman will be emphasized.

**30.546 American Literature III** 2 Q. H.  
The rise of Realism after the Civil War, the development of American humor, the appearance of local color writers, and modern trends since 1900.

**Note:** All English majors enrolling in Course 30.551 to 30.599 should have completed 30.509 and one full-year survey course (taken from those listed as 30.531 to 30.546) or secured the approval of the Dean.

<b>30.551 Chaucer I</b>	2 Q. H.
“The Canterbury Tales,” with attention to Middle English vocabulary, historical setting, and the rhythms and devices of Chaucer’s poetry.	
<b>30.552 Chaucer II</b>	Prereq. 30.551; 2 Q. H.
More of “The Canterbury Tales,” and a beginning in the text of “Troilus and Criseyde.”	
<b>30.553 Chaucer III</b>	Prereq. 30.552; 2 Q. H.
An emphasis on “Troilus and Criseyde,” and on certain shorter works of Chaucer.	
<b>30.554 Shakespeare I</b>	2 Q. H.
The status of the theatre in Elizabethan London, economic and political factors of the era, and Shakespearean criticism. “The Comedy of Errors,” “A Midsummer Night’s Dream,” “The Merchant of Venice,” “As You Like It,” “Twelfth Night,” and other plays will be studied intensively.	
<b>30.555 Shakespeare II</b>	Prereq. 30.554; 2 Q. H.
Introducing the student to the “problematical” comedies of Shakespeare, and to the histories. The course includes “Cymbeline,” “All’s Well That Ends Well,” “Measure for Measure,” “Troilus and Cressida,” “Richard II,” “Henry IV,” parts I and II, and other plays.	
<b>30.556 Shakespeare III</b>	Prereq. 30.555; 2 Q. H.
Emphasis on the major tragedies of Shakespeare.	
<b>30.557 Restoration Literature</b>	2 Q. H.
Principal authors of the Restoration Period in England, including Wycherley, Locke, Dryden, Bunyan, Defoe, Congreve, and Pepys.	
<b>30.558 The Age of Pope and Swift</b>	2 Q. H.
The age of Pope and Swift, with selections from Addison and Steele, Thomson, Gray, and Fielding.	
<b>30.559 The Age of Johnson</b>	2 Q. H.
The age of Johnson, with selections also from Boswell, Gibbon, Burke, Paine, Burns, Blake, Goldsmith, and Sterne.	
<b>30.561 Spenser</b>	2 Q. H.
“The Faerie Queene,” studied as the English culmination of Medieval and Renaissance romantic narrative.	
<b>30.562 Milton</b>	2 Q. H.
Close reading of “Paradise Lost,” and of such political and theological background as needed. “Samson Agonistes” will also be read.	
<b>30.564, 30.565 The Old Testament I, II</b>	4 Q. H.
Selected books from the Old Testament, examined for their literary and historical importance.	

**30.566 The New Testament** 2 Q. H.  
 Selected books from the New Testament, considered in their literary and historical aspects.

**30.571 Romantic Poets of the Nineteenth Century I** 2 Q. H.  
 Wordsworth and Coleridge, founders of the so-called Romantic Movement in poetry.

**30.572 Romantic Poets of the Nineteenth Century II** 2 Q. H.  
 Concentration on the work of Shelley, Keats, and Byron.

**30.573 Romantic Poets of the Nineteenth Century III** 2 Q. H.  
 Appraising the Victorian poets, especially Tennyson and Browning, and subsequently the pre-Raphaelites, Rossetti, Morris, and Swinburne.

**30.574 The Eighteenth-Century English Novel** 2 Q. H.  
 Background to and early decades of the novel, with readings from such representative novelists as Defoe, Fielding, Smollett, Sterne, and Austen.

**30.575 The Nineteenth-Century English Novel** 2 Q. H.  
 Study of such representative novelists as Emily Bronte, Thackeray, Dickens, Eliot, Meredith, and Hardy.

**30.576 The Twentieth-Century English Novel** 2 Q. H.  
 Study of such twentieth-century novelists as Conrad, Woolf, Joyce, and E. M. Forster.

**30.577 Conrad** 2 Q. H.  
 Conrad's art related to his Polish heritage, nautical career, theory of life and composition, and literary legacy.

**30.581 The American Short Story** 2 Q. H.  
 The development of the American short story from its nineteenth-century origins to the present. Authors include Poe, Hawthorne, James, Hemingway, and Faulkner.

**30.582 The Nineteenth-Century American Novel** 2 Q. H.  
 American fiction to the end of the nineteenth century, including Cooper, Hawthorne, Melville, Twain, James, and Howells.

**30.583 The Twentieth-Century American Novel** 2 Q. H.  
 Some of the outstanding American novelists of the twentieth century, with emphasis on the social outlook they imply. Dreiser, Lewis, Dos Passos, Hemingway, Faulkner, Steinbeck, and others.

**30.584 Contemporary American Poetry** 2 Q. H.  
 To give the student a perspective on the poetry of his own time, and to help him understand and enjoy poetry generally. The course deals with American poetry of the last fifty years and concentrates on contemporary works.

**30.585 The Modern Novel** 2 Q. H.  
 Important twentieth-century Western writers will be considered from a social, psychological, philosophical, literary, and historical viewpoint. Kafka, Joyce, Proust, Camus, Mann, Gide, and others have been selected.

**30.586 Literary Criticism**

2 Q. H.

Major schools of criticism through a study of Aristotle, Longinus, Sidney, Johnson, and a representative group of moderns.

**31—FRENCH****31.501, 31.502, 31.503 Elementary French I, II, III**

9 Q. H.

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple French prose. Develops into the reading of more difficult work accompanied by practice in conversation.

**31.504, 31.505, 31.506 Intermediate French I, II, III**

Prereq. 31.503 or equiv.; 9 Q. H.

A review of grammar. Reading of French prose of moderate difficulty. Emphasis is placed upon the acquisition of reading and conversational ability through the use of written and oral exercises.

**32—SPANISH****32.501, 32.502, 32.503 Elementary Spanish I, II, III**

9 Q. H.

Stresses the essentials of grammar, practice in pronunciation, and progressive acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Spanish prose. Develops into the reading of more difficult work accompanied by practice in conversation.

**32.504, 32.505, 32.506 Intermediate Spanish I, II, III**

Prereq. 32.503 or equiv.; 9 Q. H.

A review of grammar. Reading of Spanish prose of moderate difficulty with practice in conversation. Emphasis is placed upon the acquisition of reading and conversational ability through the use of oral and written exercises.

**33—GERMAN****33.501, 33.502, 33.503 Elementary German I, II, III**

9 Q. H.

Stresses the essentials of grammar, practice in pronunciation, and the acquisition of a basic vocabulary; the study of idiomatic expressions and use of subjunctive mood. Develops into the reading of more difficult work accompanied by practice in conversation.

**33.504, 33.505, 33.506 Intermediate German I, II, III**

Prereq. 33.503 or equiv.; 9 Q. H.

Reading of German prose of moderate difficulty, with practice in conversation. Introduction to the history of German civilization through texts of average difficulty; review of grammar; oral and written exercises.

**34—RUSSIAN****34.501, 34.502, 34.503 Elementary Russian I, II, III**

9 Q. H.

An introductory course starting with the Russian alphabet; stress is placed

on grammar, practice in pronunciation, acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Russian prose accompanied by practice in conversation.

**34.504, 34.505, 34.506 Intermediate Russian I, II, III** Prereq. 34.503; 9 Q. H.  
Reading of Russian prose of moderate difficulty, including some attention to scientific writings, with practice in conversation. Emphasis is placed upon the acquisition of reading and conversational ability through the use of oral and written exercises.

**34.507, 34.508, 34.509 Russian Literature of the Nineteenth Century I, II, III**  
Prereq. 34.506; 9 Q. H.  
Survey of the developments of Russian prose literature during the Golden Age. Representative readings from Pushkin, Lermontov, Gogol, Turgenev, Tolstoi, and Chekhov.

## 34—JAPANESE

**34.521, 34.522, 34.523 Elementary Japanese I, II, III** 9 Q. H.  
An introductory course starting with the Japanese alphabet; stress is placed on grammar, practice in pronunciation, acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Japanese prose accompanied by practice in conversation.

**34.524, 34.525, 34.526 Intermediate Japanese I, II, III**  
Prereq. 34.523 or equiv.; 9 Q. H.  
A review of grammar. Reading of Japanese prose of moderate difficulty. Emphasis is placed upon the acquisition of reading and conversational ability through the use of written and oral exercises.

## 34—ITALIAN

**34.531, 34.532, 34.533 Elementary Italian I, II, III** 9 Q. H.  
Stresses the essentials of grammar, practice in pronunciation, and the acquisition of a basic vocabulary with idiomatic expressions. Written and oral exercises are based upon simple Italian prose. Develops into the reading of more difficult work accompanied by practice in conversation.

**34.534, 34.535, 34.536 Intermediate Italian I, II, III**  
Prereq. 34.533 or equiv.; 9 Q. H.  
A review of grammar. Reading of Italian prose of moderate difficulty with practice in conversation. Emphasis is placed upon the acquisition of reading and conversational ability through the use of written and oral exercises.

## 38—JOURNALISM

**38.510 Introduction to Journalism and Public Relations**  
Prereq. 30.517; 2 Q. H.  
Techniques of reporting, researching, writing, and placing news and feature articles in newspapers, magazines, and other media, with study of the operation and functions of the press and public relations.

**38.511, 38.512 Fundamentals of Journalism I, II** Prereq. 38.510; 4 Q. H.  
A general practice course in newspaper writing; the covering of special assignments; editing the news; writing of editorials, feature articles, and columns.



## 39—ECONOMICS

**39.500 Economic Geography**

2 Q. H.

Physical geography; resource distribution; and the development of agriculture and industry, with emphasis upon basic economic institutions.

**39.501, 39.502, 39.503 Economic Principles and Problems I, II, III** 6 Q. H.  
Introduction to economic theory and problems. Business cycles, money and banking systems, fiscal policy, economic growth, fluctuations in national income, as well as the economic problems of monopoly, industrial relations, international economic problems and competing economic systems. Emphasis is placed on basic principles and laws and consideration is given to current economic problems.

**39.507, 39.508, 39.509 Intermediate Economic Theory I, II, III**

Prereq. 39.503; 6 Q. H.

Detailed development of classical equilibrium theory. The determination of prices and outputs. Theory of the firm. Introduction to mathematical analysis, as well as comprehensive analysis of the theory of distribution.

**39.510 Statistics for Quality Control** Prereq. 10.503 or equiv.; 2 Q. H.  
Fundamentals of statistical concepts and computations necessary to the understanding of statistical quality control. Frequency distributions; measures of centering and dispersion; computation of average and standard deviation for ungrouped and grouped data; determination of areas under the normal distribution curve; standard error of the mean. Combinations and permutations and their use to compute probabilities; computations associated with the hypergeometric, binomial, and Poisson distributions.

**39.511, 39.512, 39.513 Statistics I, II, III** Prereq. 39.503; 6 Q. H.  
Statistical techniques and their application; descriptive measures of shape, location, and dispersion; an introduction to probability; sampling and simple analysis of observed distributions; advanced concepts in probability; sampling and statistical inference; time series analysis; correlation and index numbers.

**39.517, 39.518 Money and Banking I, II** Prereq. 39.503; 4 Q. H.  
Institutional aspects of our monetary and banking system. Problems and policies of central banking in the United States as well as a study of the theory of money and prices, including such topics as money creation, interest theory, and monetary policy.

**39.519 Public Finance** Prereq. 39.518; 2 Q. H.  
History of United States public economy. Intergovernmental fiscal relations. Growth and development of the public economy as a part of the national economy. Public finance policies.

**39.521 Introduction to Economic Growth and Development** Prereq. 39.503; 2 Q. H.  
Examination, through an historical survey, of the rise and development of the Western market system. An introduction to the phenomenon of growth, which is central to the field of economic development, and a discussion of the alternative approaches to economic development.

**39.522 Economic Development** Prereq. 39.503, 39.521; 2 Q. H.  
An introductory discussion of the economic factor in civilization, followed by an examination of the psychological, social and political influences on economic change. The role of various economic institutions in secular development.

**39.525 American Economic History** Prereq. 39.503; 2 Q. H.  
Economic development of the United States from the Colonial Period to the present; emphasis upon the period since the Civil War. Consideration of related European developments.

**39.526 Government and Business** Prereq. 39.503; 2 Q. H.  
The role of government in economic affairs. The relationship between government and business. Theoretical analysis of interaction of various sectors of the economy.

**39.527 Labor Economics** Prereq. 39.503; 2 Q. H.  
Development of present day labor organizations, their aims and methods. Issues involved in collective bargaining. Economic implications of labor market policies. Public policy toward labor relations.

**39.528, 39.529 International Economics I, II** Prereq. 39.503; 4 Q. H.  
 Survey of the development of international commercial policies in recent times.  
 Analysis of international economic principles and of international organizations.

**39.530 Comparative Economic Systems** Prereq. 39.503; 2 Q. H.  
 Analysis and evaluation of different economic systems; capitalism, socialism, communism and fascism.

**39.531, 39.532 Business Cycles I, II** Prereq. 39.503, 39.513; 4 Q. H.  
 Theories of business cycles and their impact. Measurement of business fluctuations and forecasting. Analysis of forecasting services and business conditions.

**39.533 Business Planning and Research** Prereq. 39.503, 39.513; 2 Q. H.  
 Sources of information, strengths and weaknesses of principal measures of business activity; use of widely accepted indices in general business forecasting; sales forecasting, business cycle analysis and the effects of the broadening impact of government policies upon the individual business firm.

**39.536, 39.537 Statistical Methods in Forecasting I,II** Prereq. 39.503, 39.513; 4 Q. H.  
 Introduction to the application of time series and analysis. Among the principal topics considered are the measurements of secular trends by free hand and mathematical methods; the measurement of seasonal fluctuations; cyclical fluctuations; the general nature and calculation of index numbers; and a discussion of regression and correlation.

**39.538 Management Statistics and Business Application** Prereq. 39.503, 39.513; 2 Q. H.  
 A business-oriented study of statistical decision-making; formulation and testing of hypotheses concerning averages, proportions and deviations of single samples and differences between statistics and pairs of samples.

**39.539 Managerial Economics** Prereq. 39.503; 2 Q. H.  
 An intensive analysis of the business firm with respect to demand, cost, capital budgeting, and the implications of varying market structures for price-output relationships.

**39.540 History of Economic Thought** Prereq. 39.503; 2 Q. H.  
 Development of economic theory. The major contributions of the various schools of economic thought including the Keynesian school and later contributions.

## 40—LIBRARY SCIENCE

**40.501 Introduction to Library Science** 2 Q. H.  
 Brief survey of the history of books and librarianship. The development of libraries in the United States with some emphasis on recent federal and state library legislation. The library profession, its philosophy, publications, and organizations.

**40.502 Selection of Library Materials** 2 Q. H.  
 Principles in the selection of printed materials and audio-visual aids for the modern library; practice in preparation of book notes and book reviews.

**40.511 Organization of the Library** 2 Q. H.  
 The organization, administration and services of municipal libraries, with particular emphasis on the larger unit systems; the role of public libraries as educational institutions.

**40.512 Building and Administering the Small Library** 2 Q. H.  
 Organization and management of elementary and secondary school libraries; the library's role in the school curriculum and its services to students, faculty and the community; special problems in the coordination of materials and services.

**40.521 Reference Materials and Information Services** 2 Q. H.  
 The basic tools and methods for locating information. Evaluation of dictionaries, encyclopedias, gazetteers and atlases, handbooks, directories and indexes.

**40.522 Advanced Reference and Bibliography** Prereq. 40.521; 2 Q. H.  
 A subject approach to the landmark reference books in the social sciences, sciences and humanities; other areas considered are government documents, national and trade bibliographies.

**40.531 Introduction to Cataloging and Classification** 2 Q. H.  
 Theory and practice in descriptive cataloging, Dewey Decimal Classification, Sears subject headings, and Cutter-Sanborn numbers.

**40.532 Advanced Cataloging and Classification** Prereq. 40.531; 2 Q. H.  
 Study and experience in corporate entries, serial and non-book materials; special emphasis on Library of Congress Classification and subject headings.

**40.541 Introduction to Children's Literature** 2 Q.H.  
 The history and development of children's literature; current trends in its publication and the social forces that influence its production; standard practices of selection and evaluation of the various types of children's books.

## 41—ACCOUNTING

**41.501, 41.502, 41.503 Accounting Principles I, II, III** 6 Q. H.  
 Emphasis is placed on acquiring an understanding of fundamental accounting principles as a background to business. Topics include the basic accounting process and the analytical and interpretive aspects of accounting as a managerial tool.

**41.504, 41.505, 41.506 Accounting—Intermediate I, II, III** Prereq. 41.503; 6 Q. H.  
 For students who intend to specialize in accounting. Emphasis is placed on the understanding of the logical development of accounting principles, standards, and concepts as a foundation for advanced accounting work. Special problems

of inventory valuation, income-determination, use of funds, and cash flow are a few of the corporate problems considered.

**41.507, 41.508, 41.509 Accounting—Cost I, II, III** Prereq. 41.506; 6 Q. H.

The purpose of this course is to examine in detail the specialized problems of cost accumulation and cost analyses for executive planning and control. Although emphasis is placed on cost accounting as a highly developed quantitative system to help managers select and reach their objectives, ample attention is given to basic cost accounting methods and procedures.

**41.510, 41.511, 41.512 Accounting—Advanced I, II, III**

Prereq. 41.506; 6 Q. H.

This course is a continuation of 41.506. Students are provided with an analytical basis to encourage participation in critical evaluation of accounting concepts. Valuation accounting is stressed by emphasizing the effect of accounting valuation upon the financial statements.

**41.513, 41.514, 41.515 Accounting—Specialized Problems I, II, III**

Prereq. 41.512; 6 Q. H.

The application of fundamental theory to special business fields and business activities such as non-profit organizations, partnerships, estates and trusts, insolvent companies and consolidated financial statements. Emphasis is placed on accounting principles and their application to various situations.

**41.516, 41.517, 41.518 Auditing I, II, III**

Prereq. 41.512; 6 Q. H.

Auditing techniques, procedures, concepts and standards employed by independent public accountants. Emphasis is placed upon the legal and ethical responsibilities of the independent Certified Public Accountant in conducting an audit and upon the role and importance of internal control. Stress is placed on understanding the objectives and nature of the audit, and the coordination of the examination of accounts and their effect upon the financial statements.

**41.519, 41.520, 41.521 Federal Income Taxes I, II, III** Prereq. 41.518; 6 Q. H.

The federal tax laws and their application to the income of individuals, partnerships and corporations. The Internal Revenue Code, federal regulations and related court decisions. Research problems are assigned to students in order to acquaint them with the working tools of tax practice—the complete Federal Tax Library. Tax planning is stressed throughout the course.

**41.522, 41.523, 41.524 Seminar in Contemporary Accounting Problems I, II, III**

Prereq. 41.515, 41.521; 6 Q. H.

The historical progress of accounting; its relation to the other disciplines—economics, law, statistics; the development and present position of the basic concepts, conventions, and principles which underlie accounting. Attention is focused on those areas in which the accounting profession is most concerned and is currently attempting to achieve some uniformity. The significance and limitation of generally accepted accounting principles, postulates and conventions.

**41.529 Analysis of Financial Statements**

Prereq. 41.505; 2 Q. H.

Techniques used by management, creditors, investors and regulatory authorities in analysis and interpretation of financial statements for establishing credit ratings; determining investment value of business; testing operating

efficiency; proving effectiveness of financial and operating policies. Published corporate reports are used as case material.

**41.530, 41.531, 41.532 Controllership Accounting I, II, III**

Prereq. 41.512; 6 Q. H.

Functions and organization of the controller's department; basic techniques employed by the controller; budgeting; the interpretation of historical results and their coordination into the broad policy-making program of the business.

**41.533, 41.534, 41.535 Accounting for Management Decisions I, II, III**

Prereq. 41.503; 6 Q. H.

The use of accounting information for managerial decision making; cost flow, cost-volume-profit relationships, flow of funds and cash, coordinated budget, cost-analyses applied to decision-making; planning capital expenditures; pricing decisions; the use of qualitative techniques.

**41.536 Distribution Cost Analysis**

Prereq. 41.503; 2 Q. H.

Cost accounting with a major emphasis toward applications for marketing purposes, cost accumulation and analysis; uses of costs and cost techniques for control. Pricing will be stressed.

## 43—MARKETING

**43.501, 43.502, 43.503 Introduction to Marketing I, II, III**

6 Q. H.

The first quarter covers the description and evaluation of facilities and method used to plan, operate and evaluate marketing programs. The second quarter continues this study with emphasis upon marketing management and decision making. The third quarter includes a program of reading, discussion and analysis of current marketing topics.

**43.507 Sales Force Management I**

Prereq. 43.503; 2 Q. H.

The basic principles of personal selling, the range in qualifications required, and the role of personal selling in creative marketing efforts.

**43.508 Sales Force Management II**

Prereq. 43.507; 2 Q. H.

Personal selling through wholesalers, distributors, retailers and direct to the user in both consumer and industrial channels.

**43.509 Sales Force Management III**

Prereq. 43.508; 2 Q. H.

Organization of the sales department. Includes study of the selection of salesmen, the planning and direction of sales force activities, the operation of the sales force, and the evaluation of the results obtained.

**43.511 Creative Marketing I**

Prereq. 43.503; 2 Q. H.

Emphasis is placed upon the study of the principles and techniques of advertising and their use in the creative marketing effort.

**43.512 Creative Marketing II**

Prereq. 43.511; 2 Q. H.

Use of the principles, techniques, and materials of sales promotion and their coordination with advertising and personal selling in the effective stimulation of sales.

**43.513 Creative Marketing III**

Prereq. 43.512; 2 Q. H.

A case-method study of advertising from the viewpoint of the operating management of the enterprise. Group discussions of the balance and coordination of advertising with other elements in the marketing mix.

**43.518 Retailing I**

Prereq. 43.503; 2 Q. H.

An analysis of retail store management including store location, retail buying, merchandise management, pricing, advertising, display, sale promotions and store management responsibilities.

**43.519 Retailing II**

Prereq. 43.518; 2 Q. H.

Store layout, organization, personnel management, merchandise handling, sales staff supervision, customer services, retail accounting and control, and store protection and maintenance.

**43.520 Industrial Marketing**

Prereq. 43.503; 2 Q. H.

This course explores the marketing of products where other business firms and organizations are the customers. An analysis will be made of the cooperation and conflict demanded of and resulting from the interaction of the customer, seller, competitor, and government.

**43.525 Marketing Research I**

Prereq. 39.513, 43.503, 45.572; 2 Q. H.

Modern techniques of data collection and analysis, with emphasis upon quantitative analysis and forecasting.

**43.526 Marketing Research II**

Prereq. 43.525; 2 Q. H.

Qualitative aspects of marketing research including marketing analysis, product planning, test marketing, evaluation, and modern data-processing techniques.

**43.529 International Marketing**

Prereq. 43.509; 2 Q. H.

Opportunities, methods and policies in the development and management of international business and marketing operations.

**43.532 Marketing Management I**

Prereq. 43.503; 2 Q. H.

The decision-making and managerial aspects of selected marketing programs are analyzed through the use of case studies. Marketing programs for both the consumer and the industrial goods market are considered.

**43.533 Marketing Management II**

Prereq. 43.532; 2 Q. H.

On the basis of material and presentations available to the Marketing Management Workshop, a variety of marketing situations requiring evaluation and decision-making are considered and solutions suggested by the participants.

**43.536 Advertising Techniques**

Prereq. 43.503; 2 Q. H.

A study of the verbal and visual means of motivation, with emphasis upon the techniques and processes used to produce advertising in newspapers, radio, television, and other media.

**43.537 Sales Seminar**

Prereq. 43.509; 2 Q. H.

Advanced study of the techniques of creative personal selling including the use of visual aids, role-playing techniques and sales demonstrations.

**43.538 Sales Engineering** 2 Q. H.

Surveys the problems and presents the techniques required to successfully sell engineered products such as capital goods, systems, installations, and original equipment.

**43.541 Public Relations I** Prereq. 43.503; 2 Q. H.

An introduction to the basic principles, purposes and methods of public relations.

**43.542 Public Relations II** Prereq. 43.541; 2 Q. H.

A continuation of the introductory course, with emphasis upon the planning, management, operation, and evaluation of public relations programs.

**44—FINANCE AND INSURANCE****44.501, 44.502, 44.503 Capital Institutions and Risk Management I, II, III**

6 Q. H.

An introduction to the role of finance and insurance in the economic world. A survey of financial institutions and their functions and an analysis of the basic institutions and principles in risk and insurance.

**44.507, 44.508, 44.509 Corporate Finance I, II, III**

Prereq. 39.503, 41.503; 6 Q. H.

An analytical approach to the financial management of the business firm. Stress is placed on the importance of cash flow in analysis. The theory of optimum return on optimum assets is developed under the goal of maximizing the owner's position. Theories of capital budgeting and cost of capital are further developed and applied against considerations of acquisition of both short term and long-term assets. Internal sources of funds are discussed.

**44.510 Personal Finance** 2 Q. H.

A discussion of money, its function, dollar value; expense control through budgeting; wise buying methods and policies—charge accounts; installment buying; financial institutions for borrowing money; protection against risk to person and property; methods of saving; the place of life insurance in financial planning; owning a home; investing in securities; trust funds, investment trusts; making a will; business fluctuations and the planning of personal finances.

**44.511, 44.512 Life Insurance I, II** 4 Q. H.

Investment aspects of life insurance and modern approaches to personal and business uses. Types of contracts are analyzed from both the buyer's and the company's point of view: Legal concepts, the beneficiary clause, riders, protective clauses and settlement options, including analysis of the life insurance contract, are discussed and supplemented by recent court cases.

Types and organization of companies, including investment policy, underwriting and marketing. Risk measurement, rate-making principles and techniques, including reserves and surrender values, are presented.

**44.513 Estate Planning** Prereq. 44.512; 2 Q. H.

Wills, taxation, the marital deduction and life insurance are explained in detail. Forms of trusts, gifts and joint ownership are considered as tools

available in the estate plan. The nature and process of estate planning is described by evaluating impairments, forming the estate plan and testing the designed plan.

**44.514, 44.515, 44.516 Property and Casualty Insurance I, II, III**

Prereq. 44.503; 6 Q. H.

Thorough analysis of the fire insurance, automobile, and general liabilities policies, homeowner's contract, workmen's compensation and fidelity and surety bonds. Inland marine and selected casualty coverages are presented. Underwriting practices and problems and loss prevention and adjustment in property and casualty lines are discussed. A brief introduction to rate making. Reserves and reinsurance. Government regulation is discussed.

**44.517, 44.518, 44.519 Investments I, II, III** Prereq. 44.509; 6 Q. H.

Investment goals and objectives considered. Various types of investment compared and role of securities market examined. Attention given to the relationship between the economy and stock price averages; methods of analyzing and appraising developments within the firm; the relation of earnings dividends and cash flow to market valuation of a company's securities; and portfolio analysis and planning. General methods of security selection, formula plans and a comparison of technical and fundamental factors are considered.

**44.520 Life Insurance Problems**

Prereq. 45.550; 2 Q. H.

A case study examination of actual life and health insurance applications placing considerable emphasis on student participation.

**44.521, 44.522, 44.523 Credit Management I, II, II**

Prereq. 44.509; 6 Q. H.

Considers the matter of extension of credit and collection of receivables within the business firm. Emphasis placed on measurement of individual and general risk involved. Types of credit discussed; evidences of debt, collateral, and collateral documents; sources of credit information; evaluation of risk; collection procedures and rights of creditors.

**44.524 Property and Casualty Insurance Problems**

Prereq. 45.550; 2 Q. H.

A case-study examination of actual property and casualty insurance applications placing considerable emphasis on student participation.

**44.525, 44.526 Health and Social Insurance I, II**

Prereq. 44.513; 4 Q. H.

Developments in the field of private health insurance; health insurance related to programs for public health and preventive medicine, public assistance and social insurance. Social security, unemployment insurance, workmen's compensation, etc., are thoroughly considered.

**44.527 Business and Group Insurance and Pension**

Prereq. 44.526; 2 Q. H.

An analysis of types of insurance of primary interest to the business firm. Types of group insurance programs and related problems, company and union pension plans, and employee benefit rights are examined.

**44.528 Insurance for Management**

2 Q. H.

Risks present in modern business operation procedures to be taken with types of insurance used to indemnify against anticipated losses.

**44.531, 44.532 Seminar in Finance I, II**

Prereq. All Finance Courses and 45.547; 4 Q. H.

Student participation in the study and analysis of case histories. Individual papers presented.

**45—MANAGEMENT****45.501 Management and Organization I**

2 Q. H.

The scope and environment of business and its general operation in our society, its influences and responsibilities as seen through the roles played by the individual and the group; basic management functions, organizational structures, and managerial performance in some of the fundamental areas of business activity.

**45.502 Management and Organization II**

Prereq. 45.501; 2 Q. H.

Basic management functions as essential for effective organized group action; the interrelationship of these functions and the universality of their application to all kinds and levels of business enterprise.

**45.503 Management and Organization III**

Prereq. 45.502; 2 Q. H.

The art of management, stressing managerial decision-making and performance as applied to operational business requirements.

**45.504 Office Organization and Management**

2 Q. H.

The organizational, environmental, personnel, and operational problems encountered by the manager of the modern office. Proper selection techniques, supervision, adequate compensation policies; employee relations; efficient office layout; working conditions; analysis of office methods and systems; work simplification; selection and use of office machines; and common office functions.

**45.505 Production Control**

Prereq. 45.508; 2 Q. H.

Introduction to control in the manufacturing organization and the relationships of this control to engineering, finance and general management, especially as they apply to intermittent manufacturing versus continuous manufacturing. The use of computers in control is discussed in each affected area.

**45.506, 45.507, 45.508 Industrial Management I, II, III**

Prereq. 45.503; 6 Q. H.

Principles and techniques in the successful administration of manufacturing management; study of management and organization; policy determination; plant location; labor requirements; materials handling; routing of operations; personnel selection and training; job evaluation; wage and salary structures; motion and time study; quality, inventory production, and cost control systems.

**45.509 Production Processes**

2 Q. H.

Processes and methods used by industry in the manufacture of items from metallic and non-metallic materials. These include casting, hot and cold working, joining, machining, and finishing, using general- and special-purpose

manufacturing equipment. Factors that govern the selection of a manufacturing process; the relationships of process to material; the effect of the process on the physical properties.

**45.510 Labor Management Relations**

Prereq. 39.503; 2 Q. H.

History of the labor movement and American industrial relations developments, law, and institutions; theory of collective bargaining and the practice of management and of unions; bargaining negotiations, strikes and public policy in industrial relations and wage bargaining; employment problems, economic growth and structure change.

**45.511, 45.512 Human Relations in Personnel I, II** Prereq. 19.503; 4 Q. H.

A foundation course in personnel management, oriented especially to the supervisor's responsibilities. Includes situation analysis; problems in recruitment, selection, and training; creation and implementation of wage and other policies; complaints, grievances, and related disciplinary procedures; employee morale; labor turnover; health and safety; employee participation; collective bargaining; incidental public relations; elements of effective supervision.

**45.513 Personnel Management I**

2 Q. H.

The organization, function, and procedures of the personnel department. Its relationship and responsibility in the management organization; manpower requirements; recruitment; interviewing; counseling; selection; testing; placement; training; job analysis and evaluation; merit rating; promotion, transfer, discharge; employee publications; standards and conditions of employment; personnel policies, benefits, forms; records and reports.

**45.514 Personnel Management II**

Prereq. 45.513; 2 Q. H.

Principles, methods, and techniques used in training; a grounding in the psychology of learning; methods of analyzing and meeting training needs; techniques of effective teaching; a review of the types of training found in industry; principles and practices of organizing training activities; practical applications of training methods used in industry.

**45.515 Personnel Management III**

Prereq. 45.514; 2 Q. H.

Controlling and coordinating the combined positions of managerial capacity involving the responsibility of supervision; basic instruction in supervisor's responsibilities and objectives; planning the work and employee assignments; employees' attitudes toward management; records and reports; improving individual performance; progress of employees; personnel relations; handling of grievances; training; administering of company policies; matters related to wages; the development of a congenial, enthusiastic community of work interest through the coordination of the work of all employees.

**45.516 Material Processes**

Prereq. 45.509; 2 Q. H.

The derivation, characteristics, and applications of materials used in industry. Basic metallurgy of ferrous and non-ferrous metals and alloys. Elementary chemistry of both organic and inorganic non-metals. The thermal, physical, electrical, and chemical properties of both metals and non-metals. The combining of metals and non-metals to develop characteristics not found in either. Practical and theoretical limitations of known materials and approaches taken to meet requirements generated by aerospace development.

**45.517 Techniques of Employee Selection** Prereq. 39.513; 2 Q. H.  
Recruitment, selection, and placement techniques including pre-employment and post-employment testing, with emphasis on supervisory and professional employees.

**45.518 Wage and Salary Administration** Prereq. 39.503, 45.503; 2 Q. H.  
Theory of wage and salary determination and administration; merit and incentive plans; wage and salary structure; methods of compensation and the significance of compensation in employer-employee relations and in the economy.

**45.519 Work Simplification I** 2 Q. H.  
Process analyses and methods improvement through the use of process charts and flow diagrams; operations analysis and work place improvement, using operator charts and principles of motion economy; fundamentals of human engineering; human-element aspects of work simplification: Laboratory practice.

**45.520 Work Simplification II** Prereq. 45.519; 2 Q. H.  
Camera analysis for methods improvement through the use of micromotion and memomotion techniques; paperwork simplification; multiple-activity charting of man-machine operations; work simplification as an aid to plant layout; brain-storming. Laboratory practice.

**45.521 Employee Benefits and Social Security** Prereq. 39.503; 2 Q. H.  
Private and public programs directed toward the problems of job and worker income insecurity; unemployment in a free labor market, public unemployment compensation, training and employment services; private plans to guarantee wage income and work opportunity; severance pay and reemployment rights. Includes the study of old-age retirement, public pensions and survivor benefits; private pension plans and compulsory retirement; disability from nonoccupational causes, hospitalization and medical group insurance plans and income insurance; workmen's compensation for industrial accident and disease protection; economic, fiscal, and administrative considerations in developing and operating employer and union-management programs in private business and industry.

**45.522 Job Evaluation** Prereq. 45.503; 2 Q. H.  
Fundamental concepts of wage-payment systems; theory of wage determinations, job elements, rating scales, writing job descriptions and specifications; selection of appropriate rating plans; setting up job factors and maximum point values; use of several methods of determining specific point values; development of wage structures and integration with the principles of merit rating.

**45.523, 45.524, 45.525 Management Seminar I, II, III**  
For seniors only; 6 Q. H.  
Principles and problems in the specific functional areas of business—sales finance, production, etc. The development of an integrated analysis of the situation—the top-management point of view.

**45.526 Plant Layout**

Prereq. 45.509, 45.532; 2 Q. H.

Principles and objectives of plant layout; machine-load analysis and flow-process charting; types of layout—characteristics and evaluation; planning for utilities and services; basics of Program Evaluation Review Technique (PERT); Monte Carlo simulation technique; break-even comparison method; rate of return and cost reduction evaluation; travel charting for optimum layout; material handling and other related approaches to the over-all plant-layout problem. Projects.

**45.528 Work Measurement I**

Prereq. 45.520; 2 Q. H.

Introduction to techniques for the measurement of worker and machine output to establish basic data in the development of production and wage standards. Special emphasis on building time standards on manual and machine operations. Laboratory practice.

**45.529 Work Measurement II**

Prereq. 45.528; 2 Q. H.

A continuation of techniques and concepts of work measurement as they apply to the development of group incentive plans. Incentives for the indirect labor, work sampling and the administration of incentives in general with the pitfalls encountered. Special emphasis on cost reduction.

**45.530 Development of Standard Data**

Prereq. 45.529; 2 Q. H.

A practical and economical approach to the development of production standards for job-shop operations using the six basic forms of data; namely, curve, table, equation, nomograph, family, and multivariable. The tools learned here should reduce greatly the cost of time study, minimize inaccurate time standards, and extend incentive opportunities.

**45.531 Material Handling I**

Prereq. 45.520; 2 Q. H.

Fundamentals of material handling and storage operations usually encountered in industrial plant and commercial operations. Emphasis on problem identification and analysis, cost factors, characteristics and application of basic handling equipment such as manual and powered trucks, conveyors, elevators, cranes, and monorail systems. Evaluation of storage and packaging procedures and facilities.

**45.532 Material Handling II**

Prereq. 45.531; 2 Q. H.

Application of material-handling techniques to industrial-plant operations, including detailed analysis of receiving, raw-material storage, manufacturing process, finished-product warehousing and shipping operations. Examination of the principles of automation, establishment of management objectives, and development of plant handling and material-control systems.

**45.533, 45.534, 45.535 Management Decisions and Policies I, II, III**

6 Q. H.

Broad-spectrum decision-making to set rather than follow policy. Students will engage in all aspects of the decision-making process: fact finding, analysis of findings, and effective communication.

Case studies, outside readings and business games. In the first term, short written analysis of each case will be required from each student, and classroom emphasis will be placed on analysis and effective communication. In the second term, students will submit a report based on their own original research. In the final term, emphasis will be placed on team and group

activities in business environment. This course is open to all senior students with a 3.0 or better average.

**45.536 Gauging and Measurement for Inspection** 2 Q. H.

An operating and technical-level course involving mensuration, need and function of inspection and specifications; basic principles and techniques of measurement; various methods and equipment used for gauging and measuring; special measuring and inspection problems; quality control and process inspections.

**45.537 Purchasing I** 2 Q. H.

The role of purchasing in modern business. Organization for purchasing, purchasing policies, purchasing methods, selection of sources, specifications, contractual implications, forms and records.

**45.538 Purchasing II** Prereq. 45.537; 2 Q. H.

The economics of purchasing. Market exploration, bid analysis, pricing policies, vendor analysis, quality control.

**45.539 Purchasing III** Prereq. 45.538; 2 Q. H.

Value analysis, inventory systems and inventory control, packing and shipment, warehousing and distribution, adaptations of purchasing to E. D. P., performance evaluation.

**45.541 Law I** 2 Q. H.

CONTRACTS: Nature, kinds, and formation of contracts; essential elements; form and interpretation of contracts; breach, remedies, and damages.

**45.542 Law II** Prereq. 45.541; 2 Q. H.

AGENCY: Nature, purpose, and formation of agency relationships; rights and duties of principal and agent, scope of agent's authority; rights and duties of principal and third persons; termination of agency.

SALES: Nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer.

**45.543 Law III** Prereq. 45.542; 2 Q. H.

NEGOTIABLE INSTRUMENTS: Bills, notes, and checks; requirements of a negotiable instrument; liabilities and defenses of parties; procedure upon dishonor; discharge.

PARTNERSHIPS: Nature, kinds, and formation; rights and duties of partners; partner's authority to bind firm; relation of partners and third persons; dissolution and winding up.

**45.544 Manufacturing Processes**

Comprehensively analyzes, adapts, and applies in specific case studies, the principles of advanced manufacturing processes, including the electronics and supersonic areas.

Establishes the criteria for equipment and machinery selection for small, intermediate and large manufacturing plants, utilizing diverse processes, both from the viewpoints of new installations, modifications, and/or systematic replacements with special emphasis on conventional and computer controlled automation.

**45.545 Law of Employment Standards** Prereq. 45.510; 2 Q. H.  
 The history and development of minimum-wage laws, both state and federal; Federal Wage and Hour Act (Fair Labor Standards Act) regulations on hours of work, minimum wages and child labor, and state regulations. The Walsh-Healey Public Contracts Act as it affects employment practices of contractors who supply materials to the Government. The Davis-Bacon Act, Contract Work-Hours Standards Act. Administrative and enforcement procedures.

**45.546 Law of Employment Conditions** Prereq. 45.510; 2 Q. H.  
 Substantive and administrative provisions of the Labor Management Reporting and Disclosure Act; the Social Security Act; the Massachusetts Employment Security Act; The Massachusetts Workmen's Compensation Act. The state and federal laws and regulations relating to discrimination in hiring and employment; veterans' reemployment rights.

**45.547 Law of Finance** Prereq. 44.509, 45.543; 2 Q. H.  
 A consideration of the legal problems immediately affecting finance. Special attention is given to the field of corporate law.

**45.548 Law of Labor Management Relations** Prereq. 45.510; 2 Q. H.  
 The legal framework for collective bargaining, beginning with the historical development and the impact of the antitrust laws on labor unions; the federal and state laws regulating injunctions in labor disputes; the Railway Labor Act; the National Labor Relations Act; the Labor-Management Relations Act (Taft-Hartley); the procedures, powers and limitations of the agencies administering the statutes.

**45.550 Law of Insurance** Prereq. 45.513, 45.543; 2 Q. H.  
 A consideration of the legal problems affecting insurance. Analysis of legal problems involved in the insurance contract, in the relationship of company to customers, agent to customer, etc. Consideration of warranties and conditions affecting the risk.

**45.551 Law for Engineers** For A.S. degree holders only  
 Prereq. 45.542; 2 Q. H.  
 Legal phases of engineering including public law, property law, zoning, patents.

**45.553 The Labor Agreement** Prereq. 45.510; 2 Q. H.  
 The nature and content of labor contracts; component clauses such as union recognition and security, management prerogatives, seniority, vacations, wages, hours, working conditions; grievance analysis and arbitration procedure. Case studies in actual labor-management relations affected by such clauses; the entire collective bargaining agreement and relationship.

**45.554 Business Conference Techniques** Prereq. 45.503; 2 Q. H.  
 A study of the group process; how groups develop and the effective utilization of the group as a management tool; instruction in the planning and techniques of leading a conference; the analysis and evaluation of the group process. Classes are limited in size to allow regular and frequent participation by the students.

**45.555 Recent Labor Social Law** Prereq. 45.521, 45.546; 2 Q. H.  
 An advanced discussion of current labor-management problems such as

union responsibilities, management responsibilities, the guaranteed annual wage, profit sharing, criteria for wage determination, welfare programs. Includes a study of the Civil Rights Acts of 1964, medical and other amendments to the Social Security Act and the Equal Pay Act.

**45.556 Negotiation, Mediation, Arbitration** Prereq. 45.510; 2 Q. H.

Technical aspects of the collective-bargaining process; preparation and negotiation of demands and revising of agreement terms; the mediation process; fact-finding by neutral third parties; arbitration by neutrals; tripartite fact-finding and arbitration; grievance arbitration and processing; enforcement of voluntary agreements to arbitrate; compulsory arbitration, seizure, and other alternatives to the right to strike.

**45.557 International Labor Movements** Prereq. 45.510; 2 Q. H.

Historical treatment of American labor union developments in the eighteenth century; theories of labor organization; economic and political action; relation of labor and government, legislature, judicial, administrative, and executive; comparison of American, European, and Latin-American labor organization and institutions affecting workers; international labor organizations.

**45.558 Industrial Relations Systems** Prereq. 45.557; 2 Q. H.

Differences between and similarities of collective-bargaining institutions of different industries and trades in the U.S., the reasons and the effects; structures of union-management relations in different industries and companies; comparisons of the international differences in management practices, government programs, and collective bargaining.

**45.560 Seminar on Labor Issues** For seniors only

Prereq. 45.546, 45.548, 45.553; 2 Q. H.

An advanced discussion of current labor-management issues and related national policy for industrial relations disputes, wage guidelines, public employees' union, etc.



**45.561 Statistical Quality Control I** Prereq. 39.510 or 39.513; 2 Q. H.  
Description and practical application of the basic statistical quality-control methods for quality assurance, quality control, and quality improvement of products and services, the tools for reducing and controlling the costs of scrap, rework, repair; customer complaints and warranty. The determination of process capability; use of histograms to identify abnormal variability; the use of quality-control charts for measurable and nonmeasurable quality characteristics, including Shewhart, Multi-Vari, median, per cent defective and defects per unit; corrective-action techniques; complying with government quality-control-system requirements; psychological factors in controlling quality.

**45.562 Statistical Quality Control II** Prereq. 45.561; 2 Q. H.  
Continuation of Statistical Quality Control I, covering the application of statistical and probability considerations in acceptance sampling of purchased material, work-in-process and outgoing products. Methods of predicting sampling results using the hypergeometric, the binomial, and the Poisson distributions; development of the Operating Characteristic Curve for any sampling plan; risks involved in sampling and the concepts of AQL, RQL, AOQL. Use of standard sampling tables to select appropriate sampling plans, including Mil-Std-105 and 414; practical administration of sampling programs, material review boards, and quality audit.

**45.563 Management of Quality Control** 2 Q. H.  
Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost. Measurement of quality losses and expenses; design of programs of quality improvement; use of Pareto's Rule to identify unsolved quality problems, methods of diagnosis of defect causes. Organization of the quality function; planning for quality; quality-control engineering; inspection; quality assurance; quality audit.

**45.564 Advanced Quality Control** Prereq. 45.562; 2 Q. H.  
Detailed study of specialized techniques used in defect-cause diagnosis, process quality control and problem analysis. Complete analysis of process capability; the Multi-Vari chart; pictograms; the Span Plan method. Special-purpose quality-control charts; narrow-limit gauging, Pre-Control; Lot Plot inspection method; construction of special variables acceptance plans; use of special graph papers for computational simplification.

**45.565 Industrial Experimentation I** Prereq. 39.513 or 45.564; 2 Q. H.  
Modern small-sample techniques are applied to industrial problems. Use of statistical inference to make estimates and set confidence intervals of key characteristics of production lots and processes; design of single- and multiple-factor experiments; tests of significance; analysis of variance; use of the normal, binomial, Poisson and Chi-Square distributions, as well as non-parametric methods; shortcuts and "rough-but-quick" tests. Emphasis is on avoiding experimental blind alleys, with the associated vital savings in dollars and days.

**45.566 Industrial Experimentation II** Prereq. 45.565; 2 Q. H.  
Tests of significance, analysis of variance, correlation techniques, and experimental design.

**45.567, 45.568, 45.569 Reliability-Maintainability Management I, II, III** Prereq. Calculus Fund. or equiv.; 6 Q. H.  
Development of reliability-maintainability control concepts and techniques for application to complex military and commercial products. Derivation of fundamental principles for product reliability, maintainability, availability, warranty, and similar performance measures. Concepts and techniques developed during the first semester are put into use via organization, management, and conduct of a hypothetical reliability-maintainability program.

**45.570, 45.571, 45.572 Electronic Data Processing I, II, III** 6 Q. H.  
The first two quarters acquaint the executive, accountant, and methods and systems analyst with automatic electronic equipment and its potential applications. A comprehensive survey of the machine components of such systems, their characteristics, and assembly to handle various business accounting problems; comparison of speed, capacity, flexibility, reliability, and cost; discussion of input and output devices, memory (storage), arithmetic, and control elements; elementary programming, number systems; integrated data processing in businesses, such as retail sales, inventory, payroll, and banking accounting. The third quarter is spent studying the use of EDP as a tool of management.

This study includes the use of EDP in such areas as forecasting, inventory, production scheduling, and distribution. The basic principles of operations research and their application to business problems; the use of PERT as a scheduling and control technique. Hybrid centralized-decentralized management through computer time-sharing. Other trends.

**45.573 Basic Computer Programming** Prereq. 45.572; 2 Q. H.  
Concepts and techniques of programming. Problems and exercises in flowcharting, preparation of machine instructions, and actual program checkout utilizing EDP System installed at the University Computation Center Laboratory. Principles of programming in both machine and symbolic language.

**45.574 Computer Programming for Business I** Prereq. 45.573; 2 Q. H.  
Builds upon Basic Computer Programming (45.573) through symbolic language programming. Emphasis is given to business programs by development of such areas as peripheral equipment, macro and subroutine programs, and techniques used for program checkout. Debugging techniques are employed in a program test system for checkout of assigned programming problems.

**45.575 Computer Programming for Business II** Prereq. 45.574; 2 Q. H.  
Presentation of more sophisticated business-oriented applications of programming techniques including sorting, file maintenance, inventory control, billing and sales analysis. Development of concepts of integrated data processing. Introduction to such specialized areas as COBOL, FORTRAN, Real Time, Monitors and Control Systems.

**45.576 Common Business-Oriented Languages (COBOL)**

Prereq. 45.575; 2 Q. H.

The sophisticated programming languages which permit the user to produce a running EDP program more quickly. Compilers, report generators, sorts, executive and monitor routines and their use. Programming of examples using COBOL, the Common Business-Oriented Language adopted as the standard business programming language for the EDP industry.

**45.577 Data Systems Administration**

Prereq. 45.572; 2 Q. H.

The effective use of data-processing equipment and management sciences in meeting the information needs of business can result only from much study and detailed planning. This course is designed to treat the major phases in such a program. The analysis of company objectives, the feasibility study, the system specifications, equipment selection, and the implementation of the new system.

**45.578, 45.579 Business Data-Processing Applications I, II**

Prereq. 45.572; 4 Q. H.

The application of EDP techniques to specific business applications. Illustration of variations in processing requirements between industries, development of examples of the techniques applied to their solution and the timing and cost considerations involved. The course covers the systems consideration of a variety of input and output techniques including such areas as returnable media for promotion and billing operations and also communications for operation with remote locations. Alternative approaches to updating of files; techniques for control and checking; time-sharing through the technique of multi-programming and multi-processing. Case studies.

**45.580 Punch Card Accounting**

Prereq. 41.503; 2 Q. H.

Designed to give accountants, methods men, and executives a working knowledge of punch card accounting, what it can do, and what its limitations are. A comprehensive coverage of available equipment and of installation and operational techniques; working demonstrations of various types of equipment. The course is constantly updated to keep pace with current developments.

**45.583 Computer Programming for Scientific Applications**

Prereq. 45.573; 2 Q. H.

Designed for people whose professional background and current occupation, in either the physical or social sciences, require a working knowledge of modern, problem-oriented, computer programming. Topics included are: basic organization of a digital computer; the FORTRAN programming language; and selected applications to typical problems.

**45.584, 45.585 Concepts of Reliability Engineering I, II**

Prereq. Calculus Fund. or equiv.; 4 Q. H.

The application of reliability engineering techniques to practical problems. Statistical tools used for estimating and measuring the probability of early, random and wear-out failures. Component and simple-system reliability predictions. Reliability mathematical models and predictions are developed for complex series, and active and standby parallel systems. Reliability demonstration tests and assessments, confidence limits and preventive-maintenance policies are covered.

**45.586, 45.587, 45.588 Systems Design and Techniques I, II, III**

Prereq. 41.503, 45.503, 45.572; 6 Q. H.

Definition of a business in terms of its major functions in order to build a framework for an information or control system. Development of a systems philosophy with considerations of external and internal environment factors. Examples of the design of typical subsystems such as order entry, purchasing, production control, and payroll and their relationship to the total system will be studied. Includes a survey of techniques of systems design, analysis, and appraisal. Methods of obtaining data and cost. Interviewing techniques. Policy and Procedural Manuals. Flow charts and forms design. Charting techniques. The preparation of systems reports and proposals. A study is made of the applications of work simplification and measurement in practice. Case study, analysis of systems problems involving both theory and method. The evaluation of business organization from a systems design perspective.

**45.589, 45.590, 45.591 Advanced Systems Design I, II, III**

Prereq. 45.588; 6 Q. H.

A detailed analysis through case studies of the existing structure of the various subsystems of a business and their relationships to each other and to the whole. The analysis will form the basis for improvement of systems design through the definition of the inputs and outputs required by these subsystems and the techniques of introducing the inputs and producing the outputs.

**45.592, 45.593, 45.594 Advanced Systems Techniques I, II, III**

Prereq. 45.581, 45.591; 6 Q. H.

A detailed survey of management sciences techniques such as linear and quadratic programming, variants and regression analysis, and queuing theory; simulation and gaming theory, decision structure tables, dynamic programming, real time monitoring and control program design, and numerical control programs.

**45.595, 45.596, 45.597 Manufacturing Seminar I, II, III**

For seniors only

6 Q. H.

Problems of manufacturing operations at the plant-manager level; economics of production when considering aspects of specialization, simplification, standardization, and diversification, expansion, contraction, or integration; materials, plant location and layout, power maintenance, labor supply, organization and wage policy. Consideration of the controls of the manufacturing process: product development, scheduling, inventory, quality, cost, and budgetary controls.

**45.598 Maintainability Engineering Prereq. Calculus Fund. or equiv.; 2 Q. H.**

Mathematical concepts associated with maintainability technology and their application to the solution of practical problems. Maintainability as a major element of the "system effectiveness" concept. These mathematical methods and tools are extended to the solution of problems having one or more constraints involving spares provisioning, repair-level, built-in-test, module size, preventive maintenance, and repair technical training.

**45.615 Work Sampling** 2 Q. H.  
Fundamental concepts of work sampling covering statistical theory, formulae derivation, and the use of random numbers, control limit nomographs, and charting techniques. Discussion of the uses of work sampling in cost improvement activities and as a management control device for the plant and office. Case studies covering typical applications.

**45.620, 45.621 Industrial Safety I, II** 2 Q. H.  
Organization and administration of a comprehensive accident-prevention program; analysis of basic industrial hazards; factors involved in industrial accidents with corrective action; responsibilities and function of top management, the safety engineer, the supervisor and the safety committee; training programs; accident investigation; promoting management participation.

**45.627 Value Analysis and Planning I** 2 Q. H.  
An industry proven technique for analyzing a product or process in terms of value, function and cost relationship for the purpose of lowering its cost without sacrificing essential quality. Special emphasis will be placed on functional analysis and creativity. Case studies.

**45.628 Value Analysis and Planning II** 2 Q. H.  
Analytical approach to optimizing costs through defining product function, establishing dollar value function, revealing excessive costs and developing alternate methods. Areas pertaining to human relation factors, suppliers, the specialty vendors, product design and suggestion programs will be thoroughly investigated.

**45.629 Value Analysis and Planning III—Seminar** 2 Q. H.  
This seminar will deal with the application of value analysis. Students will select a product from their plant and apply the techniques of value analysis under the direction of the instructor. Class presentation will give him practice in this vital phase of value analysis.

**45.630 Introduction to Operations Research** Prereq. 10.506; 2 Q. H.  
An introduction to operations research for management. Following an analysis of the idealized research model, a study is made of inventory models, allocation models (including linear programming and the transportation problem), waiting-time models (queuing theory), replacement models, and competitive models (game theory, business games).

**45.631, 45.632 Operations Research Applications I, II** Prereq. 45.630; 4 Q. H.  
The various models covered in Introduction to Operations Research are set up in more complex form and are solved using the University's computer on a closed-shop basis. The FORTRAN programming language is taught and used for solving these problems.

**45.649, 45.650, 45.651 Law of Real Estate I, II, III**  
Prereq. 45.543, 47.502; 6 Q. H.  
Specific examination of the legal problems involved in instruments of conveyance, recording, and registration; the legal relationship of brokers and managers, landlords and tenants; and the legal complexities involved in marriage and death.

## 47—REAL ESTATE

**47.501 Real Estate Fundamentals I** Prereq. 44.503; 2 Q. H.  
 An examination of title and the legal process involved in acquiring real estate and a general examination of real estate financing, leases and licensing, valuation, taxes, etc.

**47.502 Real Estate Fundamentals II** Prereq. 47.501; 2 Q. H.  
 The operation of a real estate firm with specific attention to appraising, residential and commercial sales, home building, urban renewal, and industrial and shopping center development.

**47.506 Real Estate Construction Principles** Prereq. 47.502; 2 Q. H.  
 Methods of estimating for building operations, determining material and labor quantities from working drawings and specifications; consideration of job costs, insurance, taxes, etc. Importance of building codes, ordinances and administrative orders.

**47.508, 47.509 Real Estate Financial Analysis I, II** 4 Q. H.  
 Analysis of problems and risks involved in financing and investing in real property. Government agency requirements, sources of funds, borrowing methods, effect of taxes, etc.

**47.510 Real Estate Management** Prereq. 47.509; 2 Q. H.  
 The problems involved in managing a real estate firm and real property management are carefully considered.

**47.511 Residential Real Estate Appraisal** Prereq. 47.502; 2 Q. H.  
 A fundamental course in real estate appraisal with emphasis on single- and two- and three-family properties. Analysis of city and neighborhood influences; site evaluation; building diagnosis, depreciation; study of the applicable approaches to value; appraisal report preparation.

**47.512, 47.513 Commercial and Industrial Real Estate Appraisal I, II** Prereq. 47.502; 4 Q.H.  
 An advanced course in the evaluation of income properties. Application of the cost, market and income approaches to apartment buildings, and commercial and industrial developments. Particular emphasis on the various methods of capitalization and residual techniques.

**47.521, 47.522, 47.523 Urban Planning, Rehabilitation and Development I, II, III** Prereq. 47.502; 6 Q. H.  
 An analysis of current regulations, practices, and goals relating to the planning and rehabilitation of urban areas. Special emphasis is placed on urban renewal and methods of rehabilitating specific areas.

## 48—TRANSPORTATION

**48.501, 48.502, 48.503 Transportation Management I, II, III** 6 Q. H.  
 Evaluation of all transportation modes, singly and in combination with one another. Analysis of the bill of lading and other transportation documents. Study of primary concepts in transportation pricing: freight classification, classification rule and freight rates. Study of primary freight-management

functions: use of tariffs and rate procedure with carrier bureaus and the Interstate Commerce Commission; routing and consolidation of freight; special services performed by carriers—diversion reconsignment, transit, protective services, storage, tracing, switching, pickup and delivery, weighing, loading and unloading; freight-claim procedure and prevention. Management of a private transportation system; exporting and importing; inventory management; materials handling and packaging; warehousing; and factors of industrial location.

**48.504, 48.505, 48.506 Transportation Regulation and Promotion I, II, III**

Prereq. 48.503; 6 Q. H.

Study of transportation regulation as it is practiced by both federal and state governments. History and content of the Interstate Commerce Act—its impact upon carriers and upon industrial activity. Study of cases pertinent to the Commerce Clause. Examination of Administrative Law and Procedure, the Code of Ethics and the General Rule of Practice. Complete review and preparation for the Interstate Commerce Commission Practitioners Examination.

**48.511, 48.512, 48.513 Mature Transportation Systems I, II, III 6 Q. H.**

Warehousing Management—study of materials storage as an integrated element in the transportation of freight, in the reduction of distribution costs, and in the improvement of service through more precise selection of facilities. Railroad transportation—brief history of American railroads and assessment of their present position and impact on national economy. Analysis of pending mergers and development of current marketing and sales programs for both freight and passenger traffic. Primary stress on operating problems occasioned by industrial needs for service and also compelled by inter- and intra-modal competition. Analysis of the relative efficiency of the principal modes of transportation.

**48.517, 48.518, 48.519 Modern Transportation Systems I, II, III 6 Q. H.**

Packaging and claim management—analysis of the factors involved in developing quality protection of goods, thereby lessening and ultimately eliminating claims for damage and assuring greater customer satisfaction. Motor carrier operations—mission and characteristics of the industry. Types of carriers—common contract, private, exempt and local. Internal organization and administration. Sales and public relations policies. Terminal and operating management: selection, financing, maintenance, and replacement of equipment; industrial relations; safety, insurance, and taxation.

**48.521, 48.522, 48.523 Advanced Transportation Problems I, II, III**

Prereq. 48.506, 48.526; 6 Q. H.

Procedures for the reduction of distribution costs. Case problems on the function of warehousing as a method to stabilize prices and control markets. Development of a management viewpoint which will effectively relate the transportation department to all other industrial activities. A transportation survey is made, and appropriate policies for procedural action are established. Specific problems of both transportation carriers and industrial transportation departments are diagnosed and treated by the case method. Problem-solving discussions.

**48.524, 48.525, 48.526 Transportation Economics and Pricing I, II, III**

Prereq. 48.506; 6 Q. H.

Study of the economic theories underlying transportation-management decisions from both the industrial and carrier viewpoint. Principal stress on the cost factors in pricing. Analysis of the tools and techniques of rate-making. Exploration of rate structures and preparation of a rate case. Emphasis from the industrial viewpoint. Carrier policy on freight rates. Rate Bureau research and analysis procedures. Function of the Interstate Commerce Commission when industry and carriers disagree.

**48.541, 48.542, 48.543 Air Transportation I, II, III**

6 Q. H.

The economics and regulation of scheduled passenger service and scheduled cargo service. Corporate and general aviation policy-making and procedures. Areas of specific study include route structures, equipment, scheduling, operations, pricing, cost analysis and financing.

**48.544, 48.545, 48.546 Urban Transportation I, II, III**

6 Q. H.

Analysis of highways and public transportation systems in moving large numbers of people in congested areas at peak periods. The relevance of distribution and growth of population and land utilization in urban areas. Comprehensive planning to determine the nature and amount of transit extension. Appraisal of existing transit services, fares and operating policies. Blueprint for more effective transit marketing.



## 86—HEALTH CARE ADMINISTRATION

**86.501 Medical Terminology** 2 Q. H.  
A study of the terminology utilized in the patient-care setting for students without medical or nursing backgrounds. Stems; prefixes; suffixes commonly encountered in hospital and other patient-care activities.

**86.502 Hospital Law and Ethics** 2 Q. H.  
A study of important legal principles and rulings of importance to medical records administrators, hospital administrative personnel, nurses, and others. Brief introduction to interpersonal ethics in the health-care setting.

**86.503 Emergency Procedures and Accident Prevention** 2 Q. H.  
First Aid and the emergency care of injuries and medical emergencies pending the arrival of professional assistance. Emphasis on Safety and Accident Prevention throughout course.

**86.504, 86.505, 86.506 Foundations of Medical Science I, II, III** 6 Q. H.  
Study, primarily through physicians' lectures, of the major disease problems in our society, with an overview of modes of treatment. This course is intended to provide the student with a non-medical background with some appreciation of the problems faced by the physician in his daily practice, in order to facilitate communication between medical and non-medical members of the health-care team.

**86.511 Personal and Community Health** 2 Q. H.  
Principles of personal health and healthful living; their application to interpersonal relationships and community life. Discussion of important current health problems.

**86.521, 86.522 Public Health I, II** 4 Q. H.  
Principles of public health, with particular emphasis on the emerging patterns of community organization and activity in the public health field.

**86.524 Methods and Materials in Public Health Education** 2 Q. H.  
An introduction to health education in the public health context.

**86.541, 86.542, 86.543 Medical Care I, II, III** 6 Q. H.  
A survey of sociological, economic, and political factors which affect the efforts of society to provide adequate health care for all its members. Second quarter will emphasize a "workshop" approach in examining the application of these principles in medical care programs. The third quarter is organized as a current problems seminar.

**86.551, 86.552, 86.553 Organization of the Medical Records Department I, II, III** 6 Q. H.  
Principles and practices essential to the effective administration of a medical records service; professional relationships; development of standard procedures. Laboratory practice for proficiency.

**86.554, 86.555, 86.556 Medical Records Science I, II, III** 12 Q. H.  
The history of medical records; organization and content of the records; abstracting and preparing reports; storage and preservation of records. Laboratory practice for proficiency.

**86.557, 86.558 Medical Records Science IV, V** Prereq. 86.556; 8 Q. H. Analysis and coding of medical records. Procedures in special areas such as radiology, pathology, out-patient departments, and social service. New theories in medical records practice. Laboratory practice for proficiency.

**86.559 Current Issues in Medical Records Administration** 2 Q. H. A seminar course for experienced medical records librarians; discusses new problems presented to the medical records administrator by changing patterns of medical care. Registration by prior permission of instructor only.

**86.571, 86.572, 86.573 Long-term Care Administration I, II, III** 6 Q. H. The organization of care for the chronically ill and long-term acute patient. Different types of institutions in the field and their relationships to other health facilities and agencies. Case-study approaches to problems of the field. For persons interested in administrative activity in nursing homes or related health facilities.

**86.581, 86.582, 86.583 Hospital Organization and Management I, II, III** 6 Q. H. The history and development of hospitals. The contemporary American hospital system. Different types of hospital organization. Hospital departments, their functions and interrelationships. New methods of patient care in the hospital setting. Designed for the middle-management or preprofessional hospital administration candidate.

## 94—LAW ENFORCEMENT

**94.501 Administration of Justice** 2 Q. H. The interrelationship of the roles of the judiciary, federal law enforcement agencies, state police, county agencies, and municipal police departments.

**94.502 Criminal Law** 2 Q. H. Constitutional consideration; elements of a crime; statutory make-up; the law of arrest; entrapment; criminal responsibility; and defenses.

**94.503, 94.504 Evidence and Court Procedure I, II** 4 Q. H. Rules of evidence; principles of exclusion; evaluation and examination of evidence and proof; competency; consideration of witnesses; laws of search and seizure; and court procedure.

**94.508, 94.509, 94.510 Criminal Investigation and Case Preparation I, II, III** 6 Q. H. Crime-scene procedure; collection and preservation of evidence; investigative techniques; methods of preparing a case for court.

**94.514, 94.515 Police Interrogation I, II** 4 Q. H. The questioning of suspects, witnesses, victims, informants and complainants; laws governing interrogation practices; techniques for legally acceptable interrogation procedures.

**94.520, 94.521, 94.522 Traffic Law Enforcement I, II, III** 6 Q. H. Accident prevention and investigation; traffic surveys; selective enforcement; traffic engineering; and traffic safety education.

**94.525, 94.526, 94.527 Law Enforcement Identification and Records I, II, III** 6 Q. H.  
 Observation and description; handwriting and typewriter identifications; finger-printing; records systems and utilization; concentration of theoretical and practical applications.

**94.530 Police Public Relations** 2 Q. H.  
 The principles of sound public relations which apply to the entire police operation. Consideration is given to writing; public speaking; radio; television and press relations; press releases; feature stories; news conferences; the police image; public opinion and police public contact.

**94.531 Police Community Relations** 2 Q. H.  
 A survey which explores the role and function of the police in inter-group relations; human relations and minority group relations. Emphasis is placed on the responsibilities of the police in dealing with civil rights, civil disorder, riots, and public protection.

**94.532 Research Methods in Criminal Justice** 2 Q. H.  
 An opportunity for each student to conduct a research project which must be related to a specific police or correctional interest or operation. The student chooses his research project in consultation with his faculty adviser. The course meets at the discretion of the instructor. The student may consult with his adviser concerning his project at any time. A project paper showing the results of research is required.

**94.536, 94.537 Police Patrol I, II** 4 Q. H.  
 The fundamentals of uniformed police foot and vehicular patrol; development of personnel; beat layouts; mechanics of arrest; riot control; stopping methods; and the transportation of prisoners.

**94.541, 94.542 Introduction to Criminalistics I, II** 4 Q. H.  
 A survey of the elements of microscopy, spectroscopy and chemistry as they apply to the study of firearms, hair, fibers, blood, paint, tools, glass, documents, laundry marks, poisons and other materials which comprise physical evidence.

**94.544 The American Correctional System** 2 Q. H.  
 A critical survey of the correctional field covering probation, institutions and parole with special reference to their historical development, program content and current problems and needs.

**94.546, 94.547 Social Deviance I, II** 4 Q. H.  
 Analysis of the social problems of social disorganization, mental disorders, drug addiction, alcoholism, suicide, sexual behavior, world's population crisis, race and ethnic relations, family disorganization, work and automation, poverty and disrepute, war and disarmament.

**94.549, 94.550 Treatment of Offenders I, II** 4 Q. H.  
 The concept of punishment and corrections, history of corrections, capital punishment, corporal punishment, imprisonment, juvenile institutions, fines, conditional sentencing and probation, parole, treatment methods, inmate society.

**94.551, 94.552, 94.553 Correctional Administration I, II, III** 6 Q. H.  
Modern management techniques applied to correctional activities concentrating on organizing, planning, directing, controlling and budgeting.

**94.557 Investigative Report Writing** 2 Q. H.  
Interpreting and evaluating information; report content and writing; report analysis with emphasis on practical report-writing projects.

**94.560 Police Supervision** 2 Q. H.  
The police supervisor's role in discipline; interdepartmental relations, problem handling and personnel policies. Problems relating to supervisory relationships, wages, grievances, morale and safety.

**94.561 Police Juvenile Methods** 2 Q. H.  
The role of the police in crime prevention with emphasis on theory, administration, control, treatment, confinement, community resources, relations with the public, and the juvenile court.

**94.565 Seminar in Delinquency Prevention** 2 or more Q. H.  
To be arranged with permission of the instructor.

**94.567, 94.568, 94.569 Probation and Parole Practices I, II, III** 6 Q. H.  
The probation officer, social work and corrections, presentence investigation, conditions of probation and parole, probation worker and the community, effectiveness of probation and parole, administrative aspects, and prediction methods.

**94.571, 94.572, 94.573 Law Enforcement Management and Planning I, II, III** 6 Q. H.  
Modern management techniques applied to police activities concentrating on organizing, planning, directing, controlling and budgeting.

**94.574, 94.575, 94.576 Juvenile Corrections I, II, III** 6 Q. H.  
Juvenile court philosophy, juvenile court procedure, police, detention, petition, hearing, juvenile court terminology, psychologists and psychiatrists, social workers, probation officers, adjudication, juvenile court judges and juvenile institutions, after-care, prevention.

**94.577, 94.578, 94.579 Government Security Programs I, II, III** 6 Q. H.  
Department of Defense security programs; applicable federal statutes and executive orders; security clearances; handling classified information; visitor control; relations with subcontractors, vendors and suppliers; automatic time-phased downgrading and declassification; and the protection of proprietary information.

**94.582 Document Control** Prereq. 45.572; 2 Q. H.  
The use of electronic data processing in the handling and control of classified documents.

**94.583 Industrial Fire Prevention** 2 Q. H.  
The administration of industrial fire prevention programs with emphasis on equipment, engineering, construction, inspections and special hazards.

**94.584, 94.585 Plant Protection I, II**

4 Q. H.

The organization, administration and management of plant protection operations.

**94.590 Seminar in Law Enforcement**

2 or more Q. H.

To be arranged with permission of and under guidance of the instructor.

**94.593 Seminar in Correctional Program Management**

2 Q. H.

Designed to meet the needs and interests of specific groups of students and administrators and supervisors of correctional programs.



# university college faculty

(as of March, 1967)

Marshall Ackerman, B.S., M.B.A. Marketing Wm. Filene's Sons Company	J. Robert Andrews, B.S. Personnel and Industrial Relations Personnel Management Associates
Edmund E. Ackerson, B.S.B.A., LL.B. Electronic Data Processing Standard International Corporation	David D. April, B.S., M.A. Finance Mitre Corporation
Henry Adleman, B.S. Electronic Data Processing Computer Usage Development Corporation	Dion J. Archon, A.B., A.M., Ph.D. Economics Suffolk University
John P. Agnew, A.B., M.A., Ph.D. Political Science, History Pine Manor Junior College	Arnot Atherton Electronic Data Processing New England Electric System
Donald J. Aharonian, A.B., A.M. Electronic Data Processing Sylvania Electronic Systems	Anthony J. Bajdek, B.A., M.A. History Northeastern University
Francis W. A'Hearn, B.S.C.E., M.B.A. Management Mitre Corporation	Carmelo Barbagallo, B.S.B.A., M.B.A. Management Raytheon Company
William F. Allan, B.A., M.A. Political Science Northeastern University	Norman F. Barbeau Industrial Management General Electric Company
Leonard D. Allen Accounting Eastern Gas & Fuel Associates	Ivan Barofsky, B.S., M.A., Ph.D. Psychology U.S. Army Research Institute
Thomas E. Anastasi, Jr., B.S., M.Ed. English U.S. Civil Service Commission	Emerson P. Barrett, B.A. Personnel and Industrial Relations Malden Mills
Howard K. Andersen, B.S., M.A. Economics AVCO Corporation	Henry E. Bates, Jr. Library Science Thomas Crane Public Library
David E. Anderson, B.A., M.A. Science Northeastern University	Stanley A. Beecoff, A.E.E., B.B.A., M.B.A. Industrial Management American Brake Shoe Company
Marcia J. Anderson, B.A., M.A. English Northeastern University	Robert Berdahl, B.A., M.A., Ph.D. History University of Massachusetts
Robert E. Anderson, B.S. Electronic Data Processing Honeywell Inc.	John R. Berman, B.S., LL.B., LL.M. Law Conroy, Karg & Levin Attorneys at Law

Martin S. Berman, B.S., LL.B. Real Estate Berman Realty Company	Allynn W. Bowen Industrial Management Sylvania Electric Products, Inc.
John F. Best, A.B., Ed.M. Science Dorchester High School	Marvin R. Brans, B.S., M.B.A. Economics Northeastern University
Gerald J. Betro, B.S., M.B.A., C.P.A. Accounting Gerald J. Betro & Company	Roger F. Brightbill, A.B., Ph.D. Psychology Northeastern University
Aaron K. Bikofsky, B.A., LL.B. Law Enforcement Attorney at Law	George M. Brooker, B.S., M.B.A. Economics Dean Junior College
Murray D. Black, B.S.I.E., M.B.A. Industrial Management Mitre Corporation	Arthur L. Brown, B.S. Law Enforcement Private Consultant
Carl Blackman, B.S., C.P.A. Accounting In practice as Principal	James Brown, B.A., M.B.A. Industrial Management Sylvania Electronic Systems
Eugene J. Blackman, B.S., M.A. Speech, Theatre Arts Northeastern University	James W. Bruce, B.B.A. Accounting Boston Gas Company
C. Raymond Block, B.C.S., C.P.A. Accounting Acoustic Research, Inc.	John J. Brule, B.B.A., M.B.A. Management Microwave Associates, Incorporated
Harry Bloomberg, LL.B. Law Enforcement Attorney at Law	Elsa N. Buchanan Mathematics Northeastern University
Joseph Boise, B.B.A., C.P.A. Accounting U. S. Treasury Department	Bruce Bunten, B.S. Personnel and Industrial Relations Sylvania Electric Products, Inc.
Peter Bongiorni, B.S.B.A., M.S.B.A. Accounting Corenco Corporation	Charles F. Burke, B.A., M.A. Political Science University of Massachusetts
John J. Bonner, A.B., LL.B. Law Enforcement Boston Police Department	Stephen G. Burke, LL.B. Personnel and Industrial Relations Northeastern University
Arthur P. Bonney, B.S. Marketing Business Management Consultant	Peter E. Burns, B.A., M.A. English Northeastern University
Leinani K. Bortles, B.A., M.A. History Northeastern University	Charles F. Burt, B.S., M.B.A. Accounting, Finance ITEK Corporation
Theodore R. Bousquet Electronic Data Processing Honeywell Inc.	Peter J. Buttarro, A.B., LL.B., M.S.H.A. Management Parker Hill Medical Center

George A. Callahan, B.A., LL.B. Law Enforcement New Haven Railroad	Elisha B. Chrakian, A.B., M.A., A.M., Ed.M. Philosophy Consulting Psychologist
David S. Calverley, B.A., M.A. Psychology Medfield Research Foundation Worcester Junior College	Edward M. Clarke, B.A., M.A. Speech Bowen School
Paul Campanis, A.B., Ph.D. Sociology Polaroid Corporation	Eleanor Clifford, A.B. Electronic Data Processing Mitre Corporation
George K. Campbell, B.S. Law Enforcement Barnstable Police Department	William G. Coggan, B.S., M.S., Ph.D. Sociology, Psychology Littleton and Union Schools
Malcolm J. Campbell, B.S., M.Ed. Management Northeastern University	Frederick W. Cole, B.S. English Northeastern University
James E. Canavan, B.S.M.E., M.B.A. Industrial Management General Dynamics Corporation	Joseph P. Conlin, A.B. Personnel and Industrial Relations Raytheon Company
A. Arthur Capone, B.S., M.A., LL.B., Ed.M. Sociology Community Action Program of Revere	William E. Connors, A.B., M.A. Statistics U. S. Department of Labor
Ernest W. Carlson, B.S. Economics Northeastern University	Thomas H. Conway, A.B., M.B.A. Accounting Polaroid Corporation
Norman J. Cartmill, B.B.A., M.B.A. Finance Revere Copper & Brass, Inc.	Hale H. Cook, A.B., M.D., B.D., M.P.H. Health Care Administration City of Newton
Ronald P. Carver, B.S.C.E., A.M., Ph.D. Psychology U. S. Army Research Institute of Environmental Medicine	Louis Cooperstein, A.B., A.M. English, Modern Languages Northeastern University
John L. Cattanach, B.S.M.E., M.B.A. Marketing Paul R. Sturgeon Company, Incorporated	Robert M. Copeland, B.S., A.M., Ph.D. English, Modern Languages Winchester High School
Richard G. Chartier, B.A., M.A. English Becker Junior College	Richard M. Coveney, A.B., M.B.A. Economics Chandler Leasing Corporation
Thomas Chin, A.B., M.B.A. Management Raytheon Company	Richard H. Craig, A.B., M.A., Ph.D. Psychology Brandeis University
	Lester S. Cramer, A.B., LL.B. Economics, Law Attorney at Law

John F. Cronin, Jr., A.B., M.B.A., C.P.A.  
Accounting  
Raytheon Company

Brian C. Crowley, B.S., B.A.  
Accounting  
ITEK Corporation

Frederick Cunliffe, B.S., M.S., Ph.D.  
Law Enforcement  
New Hampshire State Police

John A. Curry, B.A., M.Ed.  
English  
Northeastern University

Norman Cutler, B.S., B.A., C.P.A.  
Accounting  
Certified Public Accountant

Amelia E. Cutts, B.A., M.A.  
History  
Northeastern University

Albert C. D'Amato, B.A.  
English  
Cambridge School of Business and Broadcasting

John T. Dargin, Jr., B.S.B.A., M.B.A.  
Personnel and Industrial Relations  
M.I.T.—Lincoln Laboratory

Charles Daum, LL.B.  
Marketing  
Art-Craft Optical Company of New England, Inc.

Albert S. Davis, LL.B., M.Ed., C.A.G.S.  
Security  
Mitre Corporation

Ronald C. Davis, A.B., Ed.M.  
Fine Arts  
Northeastern University

Laurence S. Day, Ph.B.  
Finance  
Private Consultant

Noel A. Day, A.B.  
Sociology  
Organization for Social and Technical Innovation

Sheila R. Decter, B.A., M.A.  
Political Science  
Lasell Junior College

Herbert Deitcher, B.B.A., M.B.A.  
Accounting  
Raytheon Company

John R. Deitrick, B.A.  
English  
Becker Junior College

Ronald Demer, B.M.E., M.B.A.  
Electronic Data Processing  
Keydata Corporation

Paul J. Derby, B.S.  
Electronic Data Processing  
Honeywell Inc.

Ellsworth F. Dertinger, B.S.E.E.  
Industrial Management  
Raytheon Company

John Dias, B.S., B.A., M.B.A., C.P.A.  
Accounting  
Price Waterhouse and Company

S. Anthony di Ciero, B.A., LL.B.  
Management  
National Labor Relations Board

Eugene P. DiCostanzo, B.S.  
Electronic Data Processing  
Honeywell Inc.

Edward Dillon, B.S., M.B.A.  
Personnel and Industrial Relations  
Raytheon Company

Alan J. Dimond, A.B., LL.B.  
Law  
Attorney at Law

James Doane, A.B.  
Economics  
Tufts University

Frank C. Doda, B.B.A., M.B.A., C.P.A.  
Accounting  
B. F. Goodrich Company

Marie Dolansky, B.S., Ed.M., Ed.D.  
Mathematics  
Northeastern University

John R. Donelan, Jr., A.B., M.S.W.  
Sociology  
Medfield State Hospital

Charles D. Donley, B.B.A., M.B.A.  
Transportation  
New England Motor Rate Bureau, Inc.

Eugene J. Doody, B.S., M.B.A.  
 Personnel and Industrial Relations  
 M.I.T.—Lincoln Laboratory

Gerald F. Downey, B.S., M.A., M.B.A.  
 Economics, Statistics  
 Northeastern University

Leo F. Droppleman, A.B., M.A., Ph.D.  
 Psychology  
 Boston University

Edward Dube, B.B.A., M.B.A.  
 Industrial Management  
 Sylvania Electric Products, Inc.

Ardyn Dubnow, B.B.A.  
 Accounting  
 Raytheon Company

Charles F. Dufton, A.B., M.A.  
 Marketing and Sales Consultant  
 Northeastern University

Michael S. Dvorchak, B.A., M.A.  
 Fine Arts  
 Northeastern University

James W. Earley, A.B., B.S.E.D.,  
 M.B.A.  
 Personnel and Industrial Relations  
 Raytheon Company

Carl W. Eastman, B.A., M.A.  
 Speech  
 Northeastern University

William T. Edgett, B.A., M.A.  
 History  
 Northeastern University

Maureen S. Edison, B.A., M.A.  
 English  
 Northeastern University

Richard L. Elia, A.B., A.M.  
 English  
 Northeastern University

David B. Ellis, A.B., LL.B., LL.M.  
 Economics  
 National Labor Relations Board

Roland F. Emero, B.A., M.S.  
 Mathematics  
 Raytheon Company

J. Michael Everett, B.Arch., M.Arch.  
 Fine Arts  
 Sasaki Dawson Demay Associates

J. Clive Enos, B.S.  
 Personnel and Industrial Relations  
 Raytheon Company

Eugene F. Fallon, B.S., M.B.A.  
 Economics  
 General Radio Company

Irwin Feigelman, B.S.  
 Accounting  
 U. S. Treasury Department

Ralph E. Fenton, B.B.A.  
 Personnel and Industrial Relations  
 Factory Mutual Engineering  
 Division

Francis X. Finigan, A.B., Ed.M.  
 Science  
 Winchester High School

Albert Finney, B.S.B.A.  
 Accounting  
 Raytheon Company

John F. Fitzgerald, Jr., B.S., M.B.A.,  
 C.P.C.U.  
 Insurance, Finance  
 Northeastern University

William Fitzgerald  
 Transportation  
 MBTA

Kevin Fitzpatrick, B.S.B.A., M.B.A.  
 Finance  
 Boston Public Library

Charles P. Fogg, B.S., Ed.M., D.Ed.  
 Science  
 Boston University

Walter L. Fogg, B.A., M.A., Ph.D.  
 Philosophy  
 Northeastern University

Douglas G. Foster, A.B., Ed.M., M.S.  
 Science  
 East Boston High School

Gale P. Foster, B.S.  
 Marketing  
 Reynolds & Foster, Incorporated

James A. Foster, B.S., C.P.C.U.  
 Insurance  
 Liberty Mutual Insurance Company

Howard H. Freedman, A.B., M.S., C.P.A. Accounting Raytheon Company	Harvey Gilman, B.S., B.A., M.B.A. Management Honeywell Inc.
Albert French, B.A. Electronic Data Processing Liberty Mutual Insurance Co.	Daniel B. Goggin, A.B., M.B.A., C.P.A. Management Houghton-Mifflin Company
Melvin W. Friedman, S.B. Industrial Management M. W. Friedman Associates	Daniel M. Goldfarb, A.B., M.A., M.A.T. Modern Languages Quincy Junior College
Walter A. Gagne, Jr., B.S., M.B.A. Management Harvard University	M. Alvin Goldstein, A.B. Electronic Data Processing Honeywell Inc.
Gladys Garber, B.A., M.A. English Northeastern University	Harold Goldstein, A.B., M.A., Ph.D. Finance Northeastern University
James H. Gately, A.B., M.B.A. Management Brigham's Incorporated	Joseph M. Golemme, S.B., M.A., C.P.A. Accounting Northeastern University
John J. Gaudet, A.B. Industrial Management Sanders Associates, Inc.	Bernard L. Gordon, B.S., M.S. Science Northeastern University
Peter B. Gay, LL.B. Law Enforcement Attorney at Law	Daniel D. Gordon, A.B., M.A. Statistics Northern Textile Association
Paul C. Gay, B.A., LL.B. Law Attorney at Law	David F. Grace, B.A., M.A. English Lasell Junior College
John A. Geary, B.S. Industrial Management Employers' Group of Insurance Companies	Walter E. Grace, R.N. Health Care Administration New England Medical Center Hospital
Raymon Gerard, B.S., M.B.A. Marketing Chase Shawmut Company	William E. Grady, B.B.A. Statistics Courier-Citizen Printing Company
Cleveland Gilcreast, B.S., M.B.A. Marketing H. P. Hood & Sons	John J. Graham, A.B., M.A., A.M., LL.B., M.ASTT. Economics Attorney at Law
Edwin S. Giles, Jr., B.M.E. Electronic Data Processing Honeywell Inc.	Douglas F. Graney, B.S., B.A. Insurance Employers' Liability Insurance Corporation
Samuel J. Gilfix, A.B. Real Estate Metropolitan Area Planning Council	Warren K. Greeley, B.A., Ph.D. Statistics Tufts University

John A. Grepp, B.A., M.A. Fine Arts Massachusetts College of Art	Joseph J. Hansen, A.B., M.B.A. Mathematics Laboratory for Electronics, Inc.
Duane L. Grimes, A.B., A.M. Political Science Northeastern University	Thomas C. Harford, A.B., M.A., Ph.D. Psychology Brockton Veterans Administration Hospital
Thomas G. Grogan Industrial Management General Electric Company	David J. Harrigan, B.S. Statistics L. A. Seder & Associates
Melvin Gross, B.B.A. Real Estate Berman Realty Company	Raymond A. Harriman Industrial Management General Electric Company
Marvin C. Grossman, B.S., M.B.A. Management Grossman Sales, Inc.	Pamela H. Hart, B.A., M.A., Certificat d'Etudes French Northeastern University
Eric N. Grubinger, B.S.E.E., M.B.A. Electronic Data Processing Honeywell Inc.	Harold Harutunian, A.B., M.A.T. Mathematics Salem State College
Forest W. Grumney, B.A., M.B.A. Mathematics N.E.G.E.A. Service Corporation	Dorothy J. Havens, B.A., M.A. English Northeastern University
Reginald W. Hachey, B.M., M.M., A.D. Music New England Conservatory of Music	Bruce C. Hawthorne, B.A., Ph.D. History Simmons College
Edward A. Hacker, B.A., M.A., Ph.D. Philosophy Northeastern University	Jared E. Hazleton, B.B.A., Ph.D. Economics Federal Reserve Bank of Boston
Sterling B. Hager Industrial Management Meyer Manufacturing Company	Hugh Healey, S.B. Industrial Management General Electric Company
Martin H. Halabian, LL.B., Adj.A., A.M. History Brandeis University	George E. Healy, LL.B. Law Enforcement Providence Police Department Attorney at Law
Donald J. Halpin, B.S.B.A., M.B.A. Finance Goodbody & Company	Warren K. Heckman, B.B.A., M.A. Management Health Survey Consultants
Isadore Halzel, B.A., M.B.A. Industrial Management M.I.T.—Instrumentation Laboratory	Thomas C. Heffernan, A.B., A.M., Ed.D., LL.B. English Boston School Committee
Lawrence Halzel, B.S., Ed.M., Ed.D. Counselor Veterans Administration Hospital	Fred H. Heilizer, B.A., M.A., Ph.D. Psychology Veterans Administration Hospital
William F. Handley, B.S. Electronic Data Processing Northrop Corporation	

Francis W. Heintz, B.S., M.B.A. Statistics Raytheon Company	Daniel F. Hurley, LL.B. Personnel and Industrial Relations U. S. Federal Mediation and Conciliation Service
George Hennessy, B.S.B.A., M.B.A. Marketing Boston Gas Company	Melvin C. Jack, B.S., M.S. Accounting Consultant
Sidney Herman, B.S., M.A. Economics Northeastern University	Phillip S. Jackson, S.B., LL.B. Law Attorney at Law
Conrad E. A. Herr, M.D. Health Care Administration Tufts University	Usameh F. Jamali, B.A., M.B.A., M.A., M.A.L.D. Economics Tufts University
Chester W. Higgins, B.B.A., M.B.A. Management Massachusetts Bay Transportation Authority	Perry G. Jameson, B.S., M.E. Mathematics Boston Latin School
Peter D. Higgins, B.S., M.B.A. Accounting ITEK Corporation	Carson C. Johnson, A.B., M.S., Ph.D. Psychology Emmanuel College
Elizabeth J. Hodges, A.B., B.S. Library Science Robbins Library, Arlington	Herbert M. Jones Finance W. G. Leavitt & Son Ins. Agency
Sumner Hoisington, B.S., Ph.D. Economics Metropolitan Area Planning Council	John Joyce, B.S., M.B.A. Management The First National Bank of Boston
Wheaton A. Holden, A.B., M.A. Fine Arts Northeastern University	Eugenia O. Kaledin, A.B., A.M. English Northeastern University
Harriet Hollenberg, B.A., M.A. Political Science Harvard University	Edward L. Kandib, A.B., Ed.M. Accounting U. S. Treasury Department
George R. Horner, B.S., M.A., U'L.D. Anthropology Eastern Nazarene College	Martin J. Kane, A.M., M.B.A. Purchasing Raytheon Company
Gerald J. Hornik, S.B., A.M. Electronic Data Processing C.E.I.R., Inc.	Joanna O. Kaplan, B.A., M.A. Anthropology Brandeis University
Thomas J. Hourihan, B.S., M.B.A. Personnel and Industrial Relations Town of Brookline	Mort S. Kaplan, B.A., M.A. Theatre Arts Northeastern University
David C. Hughes, B.S. Electronic Data Processing Honeywell Inc.	Harold D. Kastle, B.S., B.J.P., M.A. Personnel and Industrial Relations Raytheon Company

Hyman M. Kaufman, S.B., M.A., LL.B. Law Attorney at Law	Joseph T. Lamb, A.B., M.B.A. Management Parks Cramer Company
Richard A. Kaye, A.B., LL.B. Law Attorney at Law	Paul K. Lambert, B.A., M.B.A. Transportation Transportation Consultant
Lyman A. Keith, S.B., M.A., M.B.A. Management Northeastern University	Kenneth W. Lamprey, B.B.A. Finance, Accounting Public Accountant and Tax Consultant
William E. Kelly, B.S.B.A., M.B.A. Accounting M.I.T.—Lincoln Laboratory	Joseph V. Lanzetta, B.S. Law Enforcement Massachusetts State Police
Charles Kenny, B.A., M.B.A. Marketing Gillette Safety Razor Company	Norman L. Lavers, B.A., M.A., Ph.B., D.D. English Massachusetts Bay Community College
William F. Kidney, A.B., LL.B. Law Enforcement Houghton-Mifflin Company	Frank F. Lee, B.A., M.A., Ph.D. Sociology Northeastern University
Paul G. Kinsella, B.S., B.A. Real Estate Hunneman and Company, Inc.	Nancy V. Lee, B.A., M.A. English Northeastern University
Thomas J. Kinsey, A.B. Economics Boston Latin School	Jean H. Lefeber, A.B., M.A. Sociology Northeastern University
Virginia K. Kirshner, B.A. Theatre Arts Northeastern University	Richard H. Lent, B.A., M.A., Ph.D. Psychology Northeastern University
Jerome Klein, B.A., M.A., Ph.D. Psychology Veterans Administration Hospital Outpatient Clinic	Carl Leone, Jr., A.B., M.S. Mathematics North Quincy High School
John L. Kobrick, B.S., M.S., Ph.D. Psychology U. S. Department of the Army	A. Richard LeShack, A.B., A.M. Mathematics International Business Machines
Marjory A. Kolovson, R.R.L. Health Care Administration Northeastern University	Thomas S. Lester, A.B., Ed.M. English Northeastern University
Donald J. Kramer, B.S., M.B.A. Finance Edgerton Germeshausen & Grier	Albert M. Levenson, B.S., M.B.A. Statistics M.I.T.—Instrumentation Laboratory
David H. Kravetz, B.B.A., LL.B. Accounting, Law Attorney at Law	Samuel Levey, A.B., A.M., M.A., Ph.D. Management Lemuel Shattuck Hospital
Paul D. Krensky, B.S., M.S. Statistics Gillette Safety Razor Company	

David B. Levi, A.B., M.B.A. Management Raytheon Company	John MacSwan, B.B.A., M.B.A. Marketing Boston Five Cents Savings Bank
Abraham H. Levine, B.S. Industrial Management General Electric Company	William J. Madden, A.B. Accounting Donnelly Manufacturing Company
Frederic M. Levine, B.A., M.A., Ph.D. Psychology Harvard Medical School	William S. Madden, B.S., M.B.A. Economics United Fruit Company
Irwin Levy, B.S., M.B.A. Industrial Management Raytheon Company	David R. Maginnes, B.A., M.A. History Northeastern University
Lorraine Liggins, B.S., M.S. Electronic Data Processing I.B.M., F.S.D.	Arthur T. Maginnis, B.S., Ed.M. Mathematics Lynn Classical High School
Harold List, B.S., M.A. Counselor Brookline High School	William G. Maguire, A.B., Ed.M. French, Spanish South Boston High School
Benjamin A. Little, A.B., Ed.M. English Gloucester High School	Therese N. Malcolm, A.B., M.A. Sociology Massachusetts Association for Adult Blind
Colin Livesey, B.S., Ed.M. Science Boston University	Ernest Manchin, B.B.A. Insurance Employer's Group of Insurance Companies
John A. Lloyd, B.A. English DASA Corporation	Albert R. Manson, B.B.A. Electronic Data Processing American Mutual Liability Insurance Company
Russell H. Lord, Jr., B.A., M.A. English Boston University	Julius Mariasis, B.A., M.B.A. Management Chemclean Corporation
Edwin H. Lovequist, Jr., B.S. Industrial Management General Electric Company	L. Leialoha A. Mark, A.B., M.S. English Mt. Wachusett Community College
Paul E. Lyons Quality Control Gillette Safety Razor Company	Joseph V. Marrocco, B.A., B.S., M.B.A. Finance United Shoe Machinery Corporation
Thomas G. Macbeth, A.B., M.A., Ph.D. Economics Lowell Technological Institute	Richard Marrs, B.S., M.Ed. Management General Electric Company
Edmund M. MacCloskey, A.B., A.M. English, Speech, French Winchester High School	John E. Marshall, B.S. Industrial Management Industrial Consultant
Robert K. MacDonald, B.A., M.A. History Northeastern University	

Thomas Martin, B.S.B.A., C.P.A.	Elmer Michelson, M.A.
Accounting	Fine Arts
Thomas J. Martin, C.P.A.	Chandler School for Women
Russell B. Mason, B.S., M.B.A.	Cedric B. Minas, LL.B., LL.M.
Marketing	Economics
Raytheon Company	Medford Senior High School
A. Robert Matt, A.B.	Attorney at Law
Law Enforcement	
A. Robert Matt Associates	
Maurice I. May, B.A., M.S.H.A.	James F. Molloy, Jr., B.S.B.A., M.B.A.
Health Care Administration	Transportation
Hebrew Home for the Aged	Systems Analysis and Research
George K. McCart, B.S., M.B.A.	Corporation
Finance	
USAF—Hanscom Field	
Paul W. McCree, Jr., B.S.	Robert A. Mongeau, B.B.A., M.B.A.
Electronic Data Processing	Management
Raytheon Company	Laboratory for Electronics
Andrew McDonough, B.S.	C. Robert Montgomery, B.A., P.E.
Finance	Management
Truman Hayes and Company	Parke Mathematical Laboratories, Inc.
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History	Management
Newton College of Sacred Heart	Western Electric Company
Suzanne M. McGowan, A.B., A.M.	James Moore, B.M.E., M.S.
English	Industrial Management
Stoughton High School	Northeastern University
John McGrath, B.S.	Timothy F. Moran, B.S.
Finance	Law Enforcement
New England Telephone Company	Northeastern University
Thomas J. McHugh, B.S., M.B.A.	Leslie B. Morash, B.S., M.B.A.
Finance	Transportation
Franchised Agent	Service Warehouse Company
John F. McLaughlin, B.L.I., Ed.M.	Norman R. Moray, Jr., B.A., LL.B.
English	Insurance
Massachusetts Bay Community	Hartford Fire Group
College	
Thomas J. McNamara, B.S.	Jerry A. Morris, B.S., M.B.A.
Electronic Data Processing	Personnel and Industrial Relations
Honeywell Inc.	Raytheon Company
William R. McPherson, B.A., M.A.	Richard Morrison, B.S.Ed.
Science	Electronic Data Processing
Harvard University	New England Merchants National Bank
Nancy L. Meymand, A.B., A.M.	Arthur C. Morrow, B.S., M.B.A.
Sociology	Accounting
Northeastern University	Davis & Furber Machine Company
	Thomas A. Morse, B.S., M.S.
	English, Speech
	Winchester High School

Carolyn M. Morton, A.B., A.M., Ph.D.  
 History  
 Bradford Junior College

Mary M. Morton, B.A., M.A.  
 Electronic Data Processing  
 International Business Machines

Maura M. Morton, B.A., M.S.P.H.  
 Health Care Administration  
 Northeastern University

John J. Mulkerin, Jr., A.B.  
 Personnel and Industrial Relations  
 Walter Baker Division, General  
 Foods, Inc.

Paul V. Mulkern, A.B., M.S.  
 Personnel and Industrial Relations  
 U. S. Bureau of Labor Statistics

Joseph A. Mullen, B.B.A., M.B.A.  
 Management  
 Boston Naval Shipyard

William R. Mulvey, B.S.B.A., M.B.A.  
 Management  
 Plymouth Rubber Company, Inc.

John D. Murgo, B.S., M.S.  
 Management  
 Wentworth Institute

Paul J. Murphy, B.S., M.B.A.  
 Marketing, Management  
 General Electric Company

Robert L. Murphy, A.B., M.B.A.  
 Management  
 Signatron

Kendall B. Murray, B.S., C.P.A.  
 Accounting  
 Tufts University

A. Howard Myers, A.B., M.A., Ph.D.  
 Personnel and Industrial Relations  
 Northeastern University

Roland L. Nadeau, B.M., M.M.  
 Music  
 Northeastern University

Robert P. Najjar, B.A., M.B.A.  
 Management  
 Northeastern University

Lyn R. Narins, B.A., M.B.A.  
 Management  
 C. L. Berger & Sons, Inc.

Joe N. Nay, B.S.E.E., S.M.E.E.  
 Electronic Data Processing  
 Laboratory for Electronics, Inc.

John P. Neal  
 Economics  
 Mass. Department of Education

Theodore H. Needle, B.B.A., C.P.A.  
 Accounting  
 Penn & Needle

Alan S. Nelson, A.B., M.B.A.  
 Management  
 John Hancock Mutual Life  
 Insurance Company

Eileen T. Nickerson, B.A., M.A., Ph.D.  
 Psychology  
 Nordli, Wilson Associates

Edward Niedorf, B.E.E., M.E.E.  
 Electronic Data Processing  
 Massachusetts General Hospital

Gene A. Niro, B.S., LL.B.  
 Management  
 National Labor Relations Board

Peter D. Nixon, B.A., M.B.A.  
 Management  
 New England Electric System

Paul Norton, B.S., M.B.A.  
 Personnel and Industrial Relations  
 Northeastern University

Richard Norton, B.B.A.  
 Electronic Data Processing  
 Honeywell Inc.

Franklin Norvish, B.S., M.A.  
 English  
 Northeastern University

Edward G. Novello, B.S.  
 Transportation  
 Raytheon Company

Robert M. O'Brien, B.S.  
 Electronic Data Processing  
 Northeastern University

Edward T. O'Donnell, B.C.S., M.B.A.  
 Statistics  
 U. S. Bureau of Statistics

Thomas B. O'Heir, B.S.  
 Electronic Data Processing  
 Honeywell Inc.

Thomas O'Keeffe, A.B., A.M., Ed.M. English, History East Boston High School	Benjamin E. Pike, B.S., M.B.A. Management Chamberlayne Junior College
Harry Olins, A.B., LL.B. Law Attorney at Law	Ruth B. Pitt, B.S., M.A. Science Educational Services, Inc.
George C. Olson, B.S.B.A., M.B.A. Electronic Data Processing State Street Bank	Carmen S. Pizzuto, B.A., M.A., M.S.W. Law Enforcement Massachusetts Division of Youth Service
David S. Omar, B.S., M.Ed., M.B.A. Statistics, Accounting Dean Junior College	Lewis G. Pollock, B.A., LL.B. Finance Rudman, Pollock & Wolf
Albert J. Ottariano, B.B.A., M.S.B.A. Statistics, Management Bureau of Labor Statistics	John D. Post, A.B., M.A. History The National Shawmut Bank of Boston
George Palken, B.S. Industrial Management Benwill Publishing Corporation	Michael J. Power, A.B. English Northeastern University
John A. Palmucci, Jr., B.S., M.B.A. Economics Northeastern University	Edward J. Powers, B.B.A., M.B.A. Management General Services Administration
Victor G. Pappas, B.S., M.B.A. Personnel and Industrial Relations Mitre Corporation	John J. Prybyla, B.S.M.E., M.B.A. Finance Brockton Taunton Gas Company
Donald E. Parent, B.S. Accounting Haskins & Sells	Doris L. Pullen, A.B. English Northeastern University
Leo J. Parente, B.S., M.A.Ed., Ph.D. Accounting Simmons College	Edward V. Puopolo, B.S., LL.B. Law Attorney at Law
Steven A. Parks, B.S. Industrial Management Monsanto Chemical Company	John J. Quinlan, LL.B. Law Enforcement Attorney at Law
Herbert S. Patchell, A.B., A.M. Philosophy Boston University	David I. Randolph, A.B., M.A., Ph.D. Psychology U. S. Army Natick Laboratories
Martin L. Pendleton, Jr., B.S. Electronic Data Processing Raytheon Company	Denis G. Regan, B.S., LL.B. Law Attorney at Law
Daniel Pershonok, Ph.D. Psychology Massachusetts Mental Health Center	Charles W. Reilly, B.S., M.A. English Northeastern University
George G. Pierce, A.B., LL.B. Law Attorney at Law	

Robert E. Reordan, A.B., M.A., Ph.D. Political Science Stonehill College	Charles H. Rubin Statistics Sanders Associates
E. Leslie Robart, B.S., M.Ed., M.A. English Northeastern University	Gerald R. Rubin, B.B.A. Accounting Certified Public Accountant
Martin L. Robbins, B.A., M.A. English Northeastern University	Morton Rubin, B.A., M.A., Ph.D. Sociology Northeastern University
Raymond H. Robinson, B.A., M.A., Ph.D. History Northeastern University	Morton S. Rubin, B.S. Marketing Wm. Filene's Sons Company
Stanley O. Robinson, B.S. Industrial Management Geilich Tanning Company	Richard D. Ruggles, A.B., A.M. Science Northeastern University
Gerald A. Rogovin, A.B., B.S. Personnel and Industrial Relations Gerald A. Rogovin, Public Relations	Robert B. Russell, B.S., LL.B., LL.M. Law Enforcement Attorney at Law
Thomas V. Roli, A.B., M.S. Biology Northeastern University	Ernest J. Ryan, A.B., M.S. Mathematics South Boston High School
George H. Rolt, B.S.E.E., M.S.E.E., M.B.A. Electronic Data Processing Raytheon Company	Frank L. Ryan, A.B., M.A. English Stonehill College
Lawrence J. Romano, B.S., M.A. Law Enforcement, Modern Languages M.I.T.—Instrumentation Laboratory	Charles L. Saccardo, B.S.B.A., M.A. Economics Lowell Technological Institute
Charles L. Rose, A.B., A.M. Sociology Veterans Administration Hospital	Thaddeus Sadowski, S.B., Ed.M. Mathematics North Quincy High School
Morris Rosenberg, B.S.B.A. Accounting U. S. Treasury Department	Gregg W. Saeger, B.M., M.M. Music Sylvania Electronics
M. C. Rosenfield, A.B., A.M., Ph.D. History Lesley College	Albert P. Sagansky, B.A. Transportation Boston & Taunton Transportation
Albert H. Ross, B.S., LL.B. Personnel and Industrial Relations Attorney, U. S. Department of Labor	Mabel L. Sahakian, A.B., D.Sc., S.T.B. Philosophy, Speech Northeastern University
Robert J. Roth, B.B.A. Law Enforcement Massachusetts Department of Public Safety	Charles L. Sakey, A.B., M.A. French, English Boston Latin School
	James S. Salmon, A.B., M.A. English, Economics The First National Bank of Boston

Charles Samson, B.B.A. Quality Control Polaroid Corporation	William J. Scott, B.S., M.B.A. Finance New England Telephone & Telegraph Company
Mark Santer, B.S. Personnel and Industrial Relations Commonwealth of Massachusetts Board of Conciliation and Arbitration	Leonard A. Seder, S.B. Quality Control L. A. Seder & Associates
Richard Sarnell, A.B., M.P.A. Personnel and Industrial Relations Raytheon Company	Frank J. Seegraber, A.B., B.S. Library Science University of Massachusetts
Harry A. Saunders Finance H. Kimball, Inc.	Donald Segal Marketing Cupples Envelope Company
Gustav Schachter, B.S., M.B.A., Ph.D. Economics Northeastern University	Alexander J. Seidler, B.A. Electronic Data Processing M.I.T.—Instrumentation Laboratory
Stephen Schafer, Dr. Jur. Sociology Northeastern University	Samuel Shapiro, A.B., M.B.A., C.P.A. Finance In practice as Principal
David M. Scheffer, A.B., J.D. Accounting Widett & Kruger	Ezra H. Sheffres, B.S.E.E., M.B.A. Management Raytheon Company
Betty Lou Schissler, B.A., M.A. Psychology Northeastern University	George D. Shelby, B.A., M.B.A., Ph.D. Economics Northeastern University
Dale R. Schissler, B.A., M.A., Ph.D. Psychology Northeastern University	Arthur Sherman, A.B., LL.B. Law Attorney at Law
Robert J. Schrage, B.A., M.A. Sociology Massachusetts Bay Community College	Susan R. Shnidman, A.B., M.A., Ph.D. Psychology Northeastern University
Mary L. Schroeder, B.S., M.C.S. English Intercollegiate Club of Boston	Ruth E. Shore, B.S., M.A. English Northeastern University
Herbert J. Schwartz, B.S. Marketing Liberty Mutual Insurance Company	Vincent Silluzio, B.S., Ed.M. Science Newton South High School
Daniel C. Scioletti, B.B.A., M.S., LL.B. Law Northeastern University	Lloyd A. Skiffington, B.A., A.M. English Northeastern University
Charles R. Scoggins, B.A., M.A. Psychology U. S. Army—Hanscom Field	Joseph Skinner, A.B., M.A., Ph.D. History Massachusetts College of Pharmacy

William I. Sloane, A.B., LL.B. Law Attorney at Law	Roy C. Stephenson Health Care Administration Lowell General Hospital
Robert W. Small, B.S., Ed.M. History Massasoit Community College	Joann P. Stewart, A.B., M.A. Economics Northeastern University
Malcolm V. Smith, B.S. Mathematics New England Mutual Life Insurance Company	William Stickney, B.B.A., M.B.A., Assoc. E.E. Management Honeywell Inc.
Leo Snyder, B.A., M.M. Music Boston University	Edmund L. Stoddard, B.A. English Raytheon Company
Christos Socarides, A.B., M.A. English Winchester Public Schools	Robert C. Story Personnel and Industrial Relations Raytheon Company
Nancy B. Sokoloff, B.A., M.A. Philosophy Northeastern University	James J. Stratford, Jr., LL.B. Law Enforcement Attorney at Law
Allan Spack, LL.B., M.B.A. Law Attorney at Law	Earle B. Sukeforth, B.S. Supervisor of Instruction H. P. Hood & Sons
George L. Spangler, A.B., M.A., Ph.D. Economics The First National Bank of Boston	Frank E. Sullivan, A.B., Ed.M. English Northeastern University
Robert M. Spector, LL.B., M.A., M.Ed., Ph.D. History Worcester State College	Jeremiah G. Sullivan, B.S. Electronic Data Processing Honeywell Inc.
Francis C. Stacey, A.B., M.B.A. Industrial Management American Mutual Liability Insurance Company	Carlton B. Sweet, B.S. Business Information Systems Baird Atomic, Inc.
Joseph Stanford, LL.B. Finance Employers' Group of Insurance Companies	Allen Swenson, B.S.B.A., M.B.A. Economics Raytheon Company
Gerald J. Starkey, B.B.A. Transportation United States Lines Company	George J. Swidler, B.S. Law Enforcement Industrial Security Consultant
Stanley R. Stembridge, A.B., A.M., Ph.D. History Northeastern University	Valerie A. Taft, B.A., R.R.L. Health Care Administration Peter Bent Brigham Hospital
	Eugene M. Tangney, B.S. Management The First National Bank of Boston

Sumner B. Tapper, A.B., A.Ed. English Stoughton High School	Harvey Vetsstein, B.A., M.A. English Northeastern University
John E. Teagan, LL.B. Labor Management Relations Attorney at Law	Julius Vexler, A.B., A.M. English Commonwealth of Massachusetts Public Document Division
Francis A. Tenore, B.S. Security ITEK Corporation	Pauline S. Vexler, B.A., M.A. English Northeastern University
William A. Tesson, B.A., M.M. Music Northeastern University	Alphonse J. Vitale, B.A., M.B.A. Business Information Systems Baird Atomic, Incorporated
Alan P. Thayer, B.S., M.B.A. Economics U. S. Army Natick Laboratories	Robert F. Vitale, B.S. Electronic Data Processing Honeywell Inc.
R. C. William Thelen Industrial Management General Electric Company	Phillip A. Vultaggio, B.A., M.B.A. Economics Hanscom Field
Alan D. Tobin, B.S., LL.B., LL.M., C.P.A. Accounting Fanger, Sundell, Gary & Tobin	Therese M. Wagenknecht, B.A., M.A. Library Science Wellesley College
Richard W. Torian, B.S., M.Ed. Mathematics Prentice-Hall, Inc.	Mark Wainer, LL.B., LL.M. Law Attorney at Law
William Trader, B.S. Management Raytheon Company	Julia E. Walker, B.A., M.A. Political Science Simmons College
Joseph J. Trifero Transportation New York Central System	Rowell L. Waller, Jr., B.A., M.S. Library Science Attleboro Public Library
James D. Turley, B.Ph., B.A., M.Ed., M.A. Literature Dover-Sherborn Regional High School	James H. Wait, B.S., A.M., M.B.A. Marketing Eastern Gas & Fuel Associates
John A. Tyrell, Jr., B.S., M.S.Ed., Ed.D. Science Boston Public Schools	Robert B. Ware Electronic Data Processing Honeywell Inc.
Thurai S. Venkataswami, B.A., M.A. Economics Northeastern University	Bernard R. Wasserman Management U. S. Treasury Department
	Harold P. Watts, B.S., B.A., M.Ed. Finance, Insurance Northeastern University
	Frank J. Weiner, B.S., M.B.A., LL.B. Transportation Barrett & Weiner, Attorneys at Law

Joseph I. Weinrebe, B.S., M.B.A. Electronic Data Processing Keydata Corporation	David L. Wilmarth, B.S., Ed.M. Science Northeastern University
Robert L. Wells, B.S., M.A. Fine Arts Northeastern University	Robert E. Withstandley, B.B.A., M.B.A. Management U.S. Steel Corporation
Clifford H. Wenzel, A.B. Personnel and Industrial Relations Raytheon Company	Michael L. Woodnick, B.S., M.S. Speech Northeastern University
Donald Wheaton, M.B.A. Economics Northeastern University	Leslie Woods Personnel and Industrial Relations Consultant and Arbitrator
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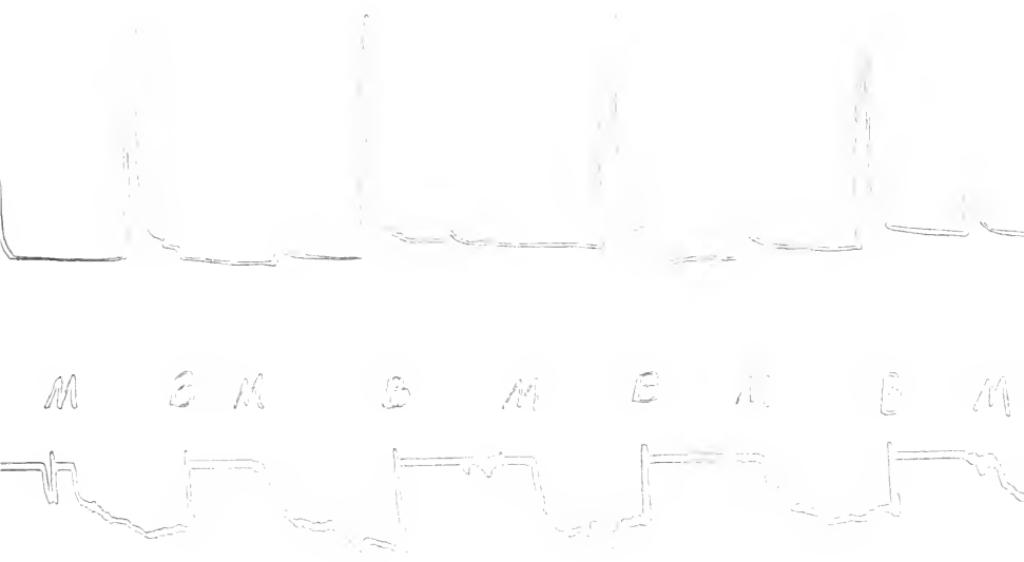
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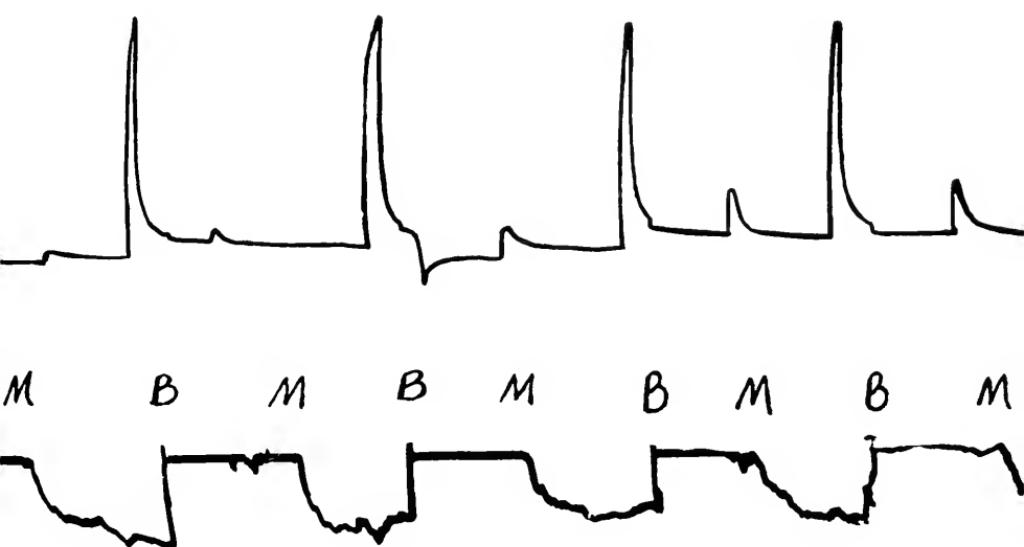
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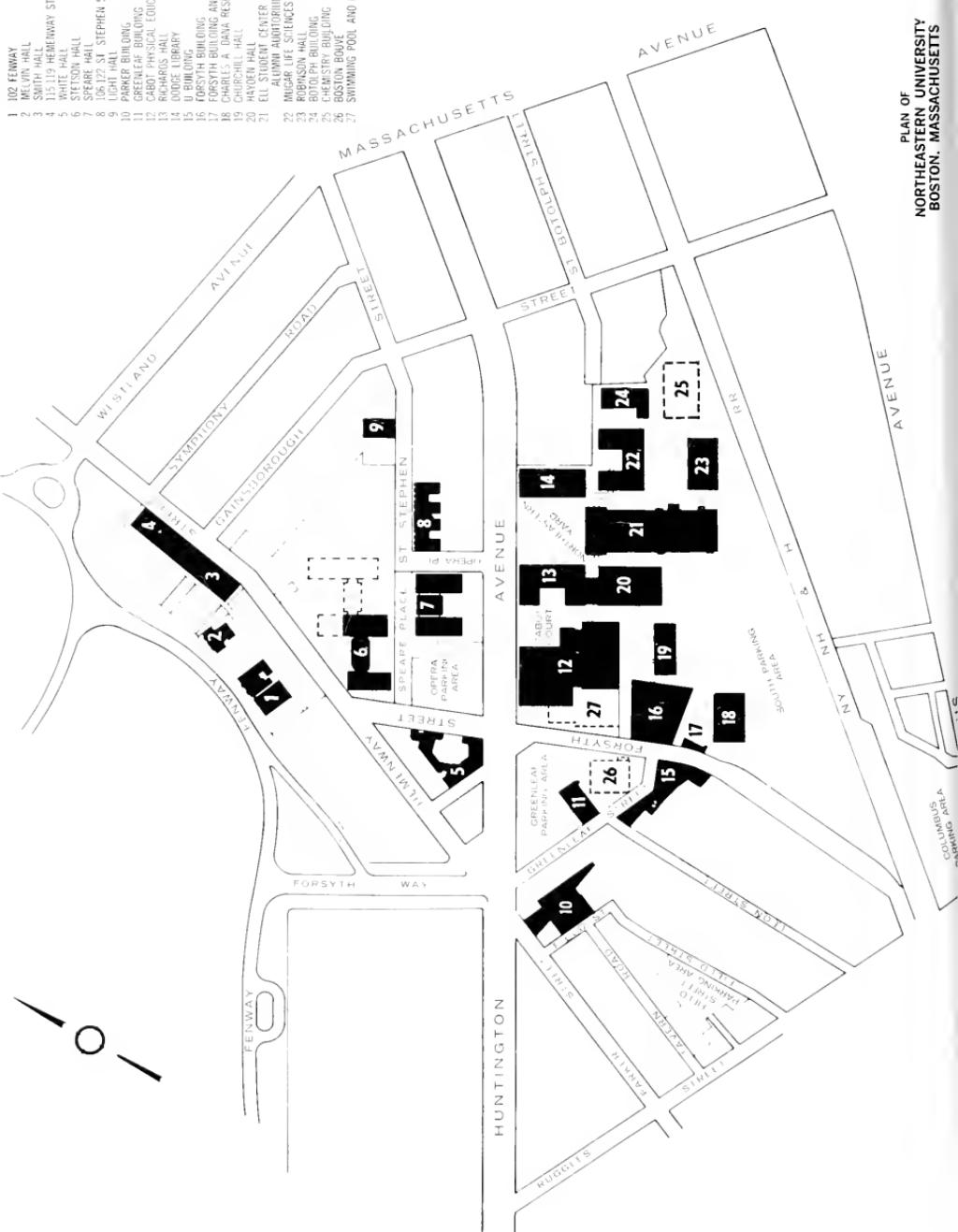


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 3 SMITH HALL  
 4 115-19 HEMINGWAY STREET  
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Frank E. Marsh, Jr., A.B., M.Ed., D.Ed.	Dean of Education
Roland H. Moody, A.B., B.L.S.	Director of the University Library
Rudolph M. Morris, B.S., Ed.M.	University Registrar
Gustav S. Rook, B.S., Ed.M.	Dean of Lincoln College
Ronald E. Scott, B.S., M.A., Sc.D.	Dean of Engineering
Robert Sheehan, A.B., M.A.	Acting Dean of Criminal Justice
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Charlotte E. Voss, B.S., M.S., Ed.D.	Dean of Nursing
Louis Vrettos, B.S., M.A., Ed.D.	Dean of Instruction and Director of the Suburban Campus

# **Aims and Scope of the University**

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), and the College of Criminal Justice (1967). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

The following is a brief outline of the aims and scope of the University's programs.

## UNDERGRADUATE COLLEGES

### BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study—Physical Education, Recreation, and Physical Therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Co-operative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

### COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

### COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

## **COLLEGE OF ENGINEERING**

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

## **COLLEGE OF LIBERAL ARTS**

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Co-operative Plan.

## **LINCOLN COLLEGE**

Lincoln College offers part-time evening programs leading to associate and/or bachelor's degrees in Allied-Medical Technology, Civil Engineering Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, and Science Technology. Additional programs in industrial, science, and allied-medical technology, leading to the Bachelor of Science degree, are offered in collaboration with University College.

## **COLLEGE OF NURSING**

The College of Nursing offers two separate and distinct programs of study, both organized on the Co-operative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General—collaborate with Northeastern by providing suitable co-operative work opportunities during the upper-class years of these programs.

## **COLLEGE OF PHARMACY**

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

## UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement and Security, and Health-Related Programs, leading to the Associate in Science and Bachelor of Science degrees. Workshops and seminars are offered for degree credit.

University College does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students.

In collaboration with University College, Lincoln College offers programs in Allied-Medical Technology and Science Technology leading to the Bachelor of Science degree.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

## GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

### ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

### ARTS AND SCIENCES

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, and Psychology.

### BUSINESS ADMINISTRATION

Master of Business Administration.

### EDUCATION

Master of Education.

### ENGINEERING

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and

master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

### **PHARMACEUTICAL SCIENCES**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

### **PROFESSIONAL ACCOUNTING**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

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Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

### **PROGRAMS FOR ADULT WOMEN**

These programs were developed to meet the needs of women with family or other obligations who wish to engage in part-time study during the day. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered. Enrollment is not restricted to women.

### **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working co-operatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## AFFILIATED PROGRAMS

### FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

### FOR MEDICAL TECHNOLOGISTS

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

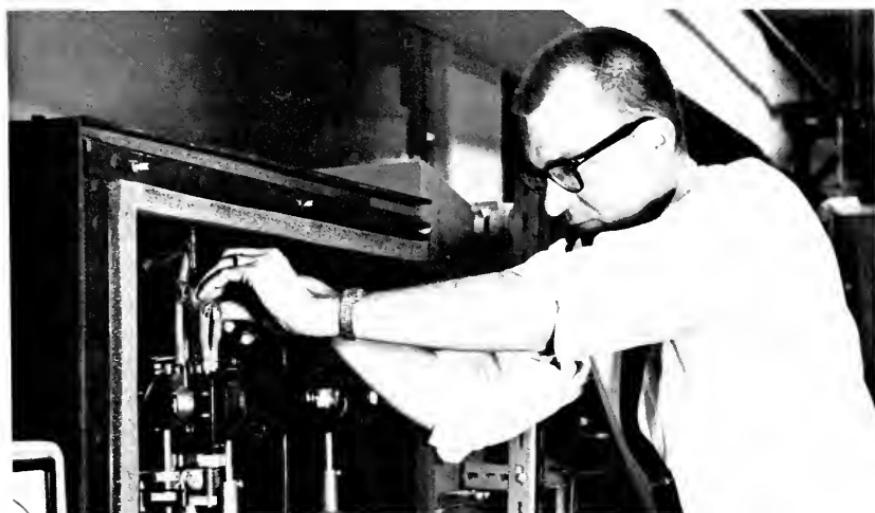
### FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

## RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



# ***Buildings and Facilities***

Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South Stations. To reach the University from the North Station, board an MBTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

## **HUNTINGTON AVENUE CAMPUS**

The principal educational buildings of Northeastern University are located on Huntington Avenue on 16 acres of a 47-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 4.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to nine new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The new buildings are interconnected by means of tunnels.

In addition to classrooms and instructional offices, the principal buildings and facilities are:

**Botolph Building.** Civil Engineering Laboratories.

**Cabot Physical Education Center.** Facilities for physical education and athletics; gymnasium; cage; rifle range.

**Churchill Hall.** Graduate Division; Physics Laboratories; faculty and staff cafeteria.

**Dodge Library.** Library; Center for Programmed Instruction; Engineering drawing rooms; Language Laboratory.

**EII Student Center.** Student activities; chapel; auditorium; student cafeteria; bookstore; student lounges and meeting rooms.

**102 The Fenway.** Center for Reading Improvement; Stearns Center for Research; gymnasium.

**Forsyth Building.** Laboratories for Industrial Engineering, Mechanical Engineering, and Allied Medical Sciences; planetarium; University Infirmary and Health Services.

**Greenleaf Building.** ROTC headquarters; research facilities.

**Hayden Hall.** Lincoln College; University College; Colleges of Business Administration, Education, Engineering, and Liberal Arts; Electrical Engineering Laboratories.

**Mugar Life Sciences Building.** College of Pharmacy; laboratories for Biology, Chemical Engineering, and Psychology.

**Research Building.** Research facilities for Electrical Engineering and Physics.

**Richards Hall.** Administrative offices; laboratories for Chemistry and Mechanical Engineering; bookstore.

**Robinson Hall.** Boston-Bouvé College; College of Nursing; laboratories for Biology and Physical Therapy; radio and television facilities.

**United Realty Building.** Research facilities for Mechanical Engineering, Biology, Psychology, and Chemistry; Institute for Rehabilitation.

### SUBURBAN CAMPUS AT BURLINGTON

In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-art programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

### HENDERSON HOUSE

At Henderson House in Weston, Massachusetts, Northeastern University operates one of the nation's finest off-campus centers for continuing education. Adults enroll in short-term courses, seminars, and special institutes at this conference center, located 12 miles from the main campus on Huntington Avenue.

### WARREN CENTER

A 70-acre tract in Ashland, including a small lake, is being developed for use as a laboratory for instruction in physical education and recreation.

# **Calendar**

## **1967**

### **Registration for Fall Quarter**

#### **Boston**

Seniors . . . . .	5:30– 9:00 p.m. . . . .	September 5
Former Students .	5:30– 9:00 p.m. . . . .	September 6–8
	9:00–12:00 noon . . . . .	September 9
New Students . . .	5:30– 9:00 p.m. . . . .	September 11–15
	9:00–12:00 noon . . . . .	September 16
Burlington . . . . .	12:00– 8:30 p.m. . . . .	August 29, 30, 31
	5:30– 9:00 p.m. . . . .	September 12 & 14
Weymouth . . . . .	5:30– 9:00 p.m. . . . .	September 5, 6, 7
Framingham . . . . .	5:30– 9:00 p.m. . . . .	September 5, 6, 7

Fall Quarter begins . . . . .	September 18
Columbus Day—no classes . . . . .	October 12
Veterans Day—no classes . . . . .	November 11
Thanksgiving Recess . . . . .	November 23–25
Classes Resume . . . . .	November 27
Final Exam Period for Fall Quarter . . . . .	December 4–9

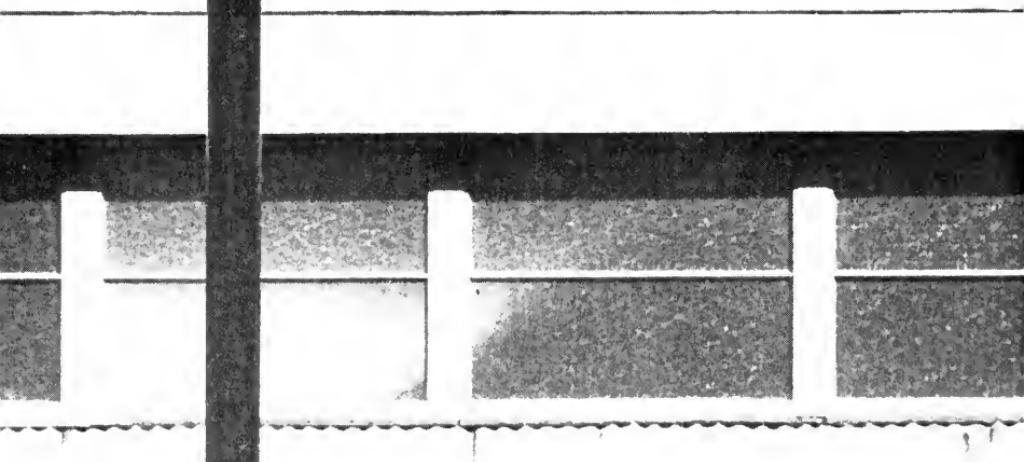
### **Registration for Winter Quarter**

Boston . . . . .	5:30– 9:00 p.m. . . . .	December 4–8
	9:00–12:00 noon . . . . .	December 9
Burlington . . . . .	12:00– 8:30 p.m. . . . .	December 1
Weymouth . . . . .	5:30– 9:00 p.m. . . . .	December 5
Framingham . . . . .	5:30– 9:00 p.m. . . . .	December 7

Winter Quarter begins . . . . .	December 11
Christmas Recess . . . . .	December 23–January 1

# 1968

Classes Resume . . . . .		January 2
Washington's Birthday—no classes . . . . .		February 22
Final Exam Period for Winter Quarter . . . . .		March 4–9
<b>Registration for Spring Quarter</b>		
Boston . . . . .	5:30– 9:00 p.m.	March 4–8
	9:00–12:00 noon	March 9
Burlington . . . . .	12:00– 8:30 p.m.	March 1
Weymouth . . . . .	5:30– 9:00 p.m.	March 5
Framingham . . . . .	5:30– 9:00 p.m.	March 7
Spring Quarter begins . . . . .		March 11
Spring Recess . . . . .		March 11–16
Classes begin . . . . .		March 18
Patriots' Day—no classes . . . . .		April 19
Memorial Day—no classes . . . . .		May 30
Final Exam Period for Spring Quarter . . . . .		June 3–8
<b>Registration for Entire Summer Quarter</b>		
Boston . . . . .	4:30– 9:00 p.m.	June 10–14
	9:00–12:00 noon	June 15
Burlington . . . . .	12:00– 8:30 p.m.	June 11
<b>Registration for Summer Quarter II and Summer Quarter B (six weeks)</b>		
Boston . . . . .	12:00– 8:30 p.m.	July 15
	12:00– 8:30 p.m.	July 29
Burlington . . . . .	12:00– 8:30 p.m.	July 15
<b>Registration for Summer Quarter III</b>		
Boston . . . . .	12:00– 8:30 p.m.	August 12
Burlington . . . . .	12:00– 8:30 p.m.	August 12
Summer Quarter I . . . . .		June 17–July 12
Summer Quarter II . . . . .		July 15–August 9
Summer Quarter III . . . . .		August 12–September 6
Summer Quarter A . . . . .		June 17–July 26
Summer Quarter B . . . . .		July 29–September 6



# LINCOLN COLLEGE ADMINISTRATION

## ADMINISTRATIVE OFFICERS

Gustav S. Rook, B.S., Ed.M., *Dean*

George A. Mallion, B.Ch.E., <i>Assistant Dean</i>	Frank E. Truesdale, B.S., Ed.M., <i>Assistant Dean</i>
Edmund J. Mullen, B.A. <i>Registrar</i>	John L. O'Leary, Jr., B.S. <i>Assistant Registrar</i>

## ACADEMIC ADVISORY COUNCIL

Gustav S. Rook, *Chairman*

Frank E. Truesdale, <i>Vice Chairman</i>	George A. Mallion, <i>Secretary</i>
Hollis S. Baird	Edward M. Cook
Fletcher S. Boig	Robert S. Lang
Leroy M. Cahoon	Ernest E. Mills
Laurence F. Cleveland	Nathan W. Riser
	Thomas H. Wallace

## CURRICULUM ADVISORY COMMITTEE

Gustav S. Rook, *Chairman*

Frank E. Truesdale, <i>Vice Chairman</i>	George A. Mallion, <i>Secretary</i>
Robert J. Averill	John L. Freedman
Hollis S. Baird	Britta L. Karlsson
Fletcher S. Boig	Nicholas P. Kernweis
Franklyn K. Brown	Robert S. Lang
William O. Bruehl	Walter Messcher
Leroy M. Cahoon	Carl Miller
Bruce B. Claflin	Ernest E. Mills
Laurence F. Cleveland	Theodore J. Morin Jr.
Thomas C. Coleman	Nathan W. Riser
Edward M. Cook	Thomas H. Wallace
Warren C. Dean	George B. Welch
	Albert G. Wilson

## OFFICE STAFF

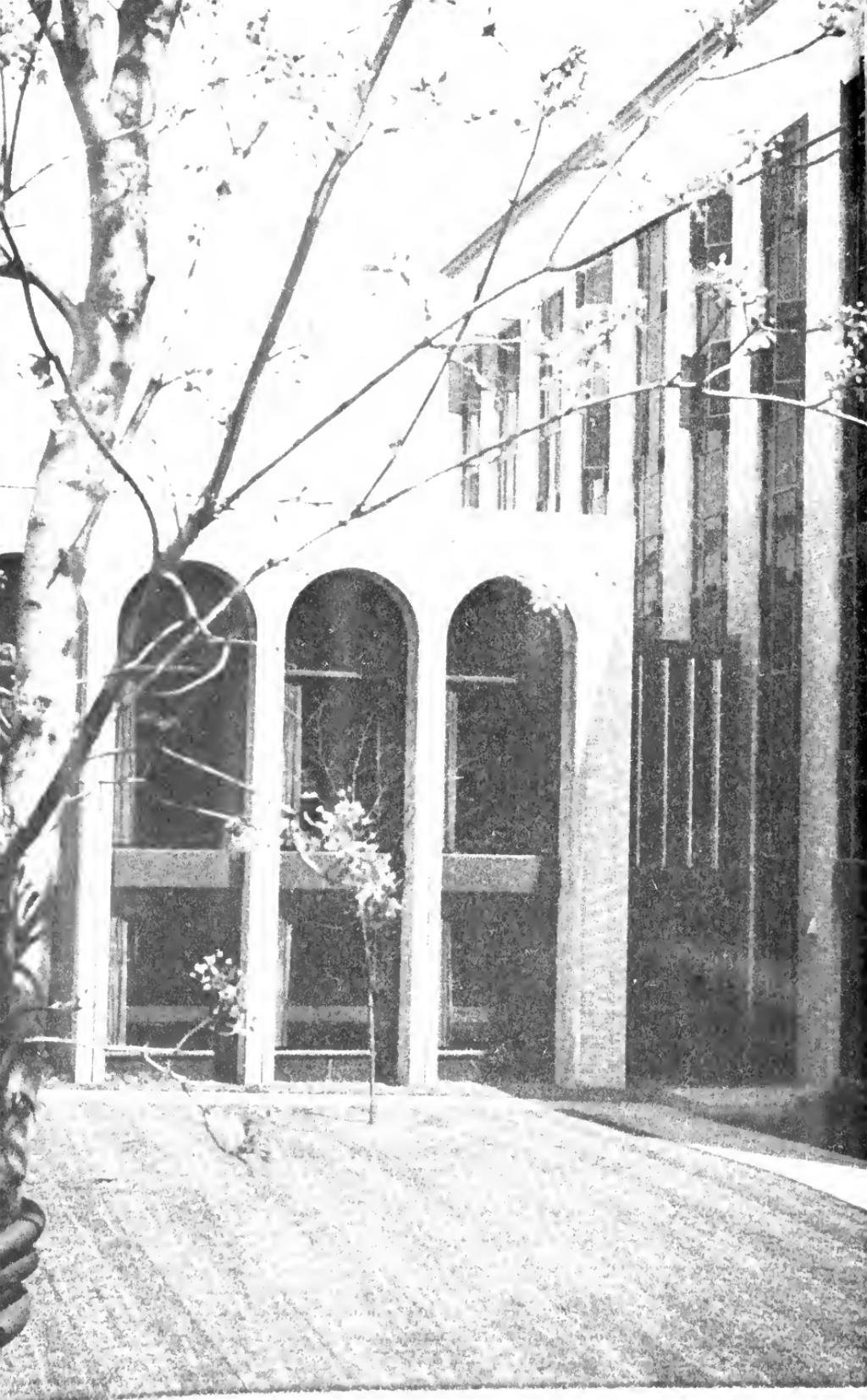
Rasma Kleinbergs, *Administrative Secretary*

Carole A. Pierce, *Administrative Secretary*

Judith Maguire, *Receptionist*

Ruth Emerson, *Clerk-Typist*

Edith R. Clark, *Clerk-Typist*



# **The Role and Scope of Lincoln College**

## **PURPOSE**

Lincoln College is charged with the responsibility for developing and offering college-level courses and curricula of an applied science or technological nature to meet community needs for professional personnel qualified to deal with the applications and uses of the biological, natural, and physical sciences. The programs of study conducted by the College have in common the following purposes and characteristics:

1. The programs of instruction prepare the graduate for activities allied to the fields of engineering, science or medicine, but are more specialized than those required to prepare a person for full professional responsibilities.
2. The programs of instruction are more concise and more completely technological in content than professional curricula, though they are concerned with the same general fields of scientific, engineering, industrial, or clinical specialization.
3. The programs of instruction are essentially technological in nature, based upon principles of science and include post secondary school mathematics to provide the tools to achieve the technological objectives of the curricula.
4. Emphasis is placed upon the use of rational processes in converting theories and ideas into practical techniques, procedures and products.
5. Extensive training for artisanship or craftsmanship are not included within the scope of the technological education programs.
6. Graduates from the associate degree programs **do** have opportunities for educational work leading to the Bachelor of Engineering Technology degree or the Bachelor of Science degree in related technology programs.

## TECHNOLOGY AND THE TECHNOLOGIST

Scientific and technological complexity ranges over a very broad spectrum extending all the way from extremely simple craftsmanlike activity to highly complex and abstract activity. At one end is the **professional** whose work is mostly mental in character. He studies, reasons and visualizes how new knowledge may be used in the development of solutions to technical problems. Usually he is not completely knowledgeable of the detailed procedures used by the **skilled craftsman** who executes the ideas, procedures and designs.

The **technologist** is the pivot-man on the professional-technologist-craftsman team. He works with the professional engineer, scientist, doctor, supervisor and craftsman in converting knowledge of scientific theories and practical craftsmanship into products, procedures and techniques. His responsibilities are technologically important—professional opportunities are limited only by ambition, ability, and education.

When employed in research, design or development, the technologist usually acts as direct supporting personnel to the professionals. If he functions in a capacity related to production, operation, testing or control, he usually follows a course prescribed by a professional but may not work closely under his direction. If installation, maintenance or sales are his areas of responsibility, he is frequently performing a task that would otherwise have to be performed by the professional. He thereby assumes the more routine professional functions demanded by our increasingly scientific and technical society.

In executing his functions the technologist is required to use a high degree of rational thinking, to employ post-secondary school mathematics and the principles of the biological, natural and physical sciences. The skilled technologist works with his mind as well as his hands. He considers why things work as well as how things work. To perform his functions efficiently, the technologist must effectively communicate technical and scientific information mathematically, graphically and linguistically.

## THE NEED FOR TECHNOLOGISTS

Our present technological age, with its exploding accumulation of new information and discoveries in the physical, natural and life sciences, has increased the need for people with specialized training in science and technology. Experts have recently estimated that in order to meet expanding needs, the number of students graduating from the nation's professional schools must double—a goal which is improbable in the near future.

The most reasonable alternative is to make our professional manpower more efficient by providing assistance in the form of specially trained technologists. Manpower experts believe that the present ratio of less than one technologist to each professional should ideally be nearer five to one.

Opportunities for technologists are increasing at a faster rate than any other occupational group—a 50 per cent increase is expected in the next five years. More than 100,000 technologists will be needed each year, whereas schools now graduate only 25,000 per year. The technologist's employment opportunities are varied and much demanded in health and public service organizations; atomic energy and electric power industries; metal fabricating industries; local, state and federal government agencies; the armed forces; aerospace industries; chemical, petroleum, plastics and metal industries, as well as transportation and communication industries.

### TECHNOLOGY PROGRAMS

Recognizing the need for technologists and their expanding role in modern society, Lincoln College offers engineering technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees; science technology and allied-medical technology programs leading to the Associate in Science degree; and collaborates with University College in industrial technology and medical technology programs leading to the Bachelor of Science degree. In addition to the more traditional programs, Lincoln College offers interdisciplinary programs combining instruction in closely allied fields and also certificate programs which meet special needs.

Lincoln College offers programs in Civil Engineering Technology, Control Systems Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, Medical Technology, and Science Technology.



## PROGRAMS OF STUDY

The major technological fields encompassed by Lincoln College and Lincoln College-University College programs are:

### FOUNDATIONS FOR TECHNOLOGY

Introductory Mathematics, Physics and Chemistry (non-credit) . . . . .	page 49
Reading-Improvement Program (non-credit) . . . . .	page 49
Programmed Instruction Review Courses (non-credit) . . . . .	page 49

### SCIENCE TECHNOLOGY

Chemical-Biological Technology (A.S. degree) . . . . .	page 52
Chemical-Physical Technology (A.S. degree) . . . . .	page 53
Mathematical-Physical Technology (A.S. degree) . . . . .	page 54
Chemical-Biological Technology (B.S. degree) . . . . .	pages 55-56

### ALLIED-MEDICAL TECHNOLOGY

Bioelectronic Engineering Technology (A.E. degree) . . . . .	page 60
Cytotechnology (B.S. degree) . . . . .	pages 61-62
Medical Technology (B.S. degree) . . . . .	pages 63-64

### CIVIL ENGINEERING TECHNOLOGY

Municipal and Sanitary Engineering Technology (A.E. degree) . . . . .	page 68
Structural Engineering Technology (A.E. degree) . . . . .	page 69
Surveying and Transportation Engineering Technology (A.E. degree) . . . . .	page 70
Civil Engineering Technology (B.E.T. degree) . . . . .	pages 71-72
Mechanical-Structural Engineering Technology (B.E.T. degree) . . . . .	pages 73-74

### MECHANICAL ENGINEERING TECHNOLOGY

Mechanical Engineering Technology (A.E. degree) . . . . .	page 78
Heat Engineering Technology (A.E. degree) . . . . .	page 79
Mechanical Engineering Technology (B.E.T. degree) . . . . .	pages 80-81
Mechanical-Structural Engineering Technology (B.E.T. degree) . . . . .	pages 82-83

### ELECTRICAL ENGINEERING TECHNOLOGY

Bioelectronic Engineering Technology (A.E. degree) . . . . .	page 86
Electrical Power Engineering Technology (A.E. degree) . . . . .	page 87
Electronics Engineering Technology (A.E. degree) . . . . .	page 88
Control Systems Engineering Technology (Certificate) . . . . .	page 89
Electrical Engineering Technology (B.E.T. degree) . . . . .	pages 90-91

### INDUSTRIAL TECHNOLOGY

Industrial Technology (B.S. degree) . . . . .	page 94
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# **General**

## **Admissions Information**

### **STUDENT BODY**

The student body of Lincoln College is comprised of mature men and women pursuing academic programs with an earnestness of purpose which gives promise of success in their educational and professional careers. Most students are employed in industry with vocational experience ranging from very little for the recent secondary school graduate to as much as 20 or 30 years for individuals seeking increased professional responsibility and status. Many technical career categories are represented—industrial, engineering, scientific, and allied-medical—demonstrating that, in our increasingly complex society, the key to personal advancement is education.

### **ADMISSIONS COUNSELING**

Career planning through self-analysis and competent counseling provides an understanding of professional requirements and assists students in planning educational programs appropriate to their objectives. Prospective students are encouraged to arrange for personal interviews with the Lincoln College staff of program counselors for assistance in planning their academic programs. When records of prior education and training are available, the effectiveness of the counseling interview is greatly enhanced. The University, through its Testing and Counseling Center and its Career Information Center, is also prepared to assist applicants whose educational and vocational goals are more complex or less firmly defined.

### **APPLICATION FOR ADMISSION**

Applications for the programs of study offered in the Lincoln College are accepted for admission to the Fall (September), Winter (December), Spring (March) and Summer (June) quarters. Applications should be filed as early as possible in advance of the opening of each term in order that eligibility and status may be established.

Information concerning admission may be obtained by either writing to Lincoln College or at the time of the visit to the College. The application for admission should be filled out in ink, properly signed and submitted to Lincoln College, Northeastern University, Boston, Massachusetts 02115.

### CLASSIFICATION OF STUDENTS

Applicants whose credentials are approved by the Lincoln College Committee on Admissions are admitted as: (1) Regular Students, (2) Conditioned Students, or (3) Special Students.

**Regular Students.** Applicants presenting evidence of completion of an approved secondary school course, or the equivalent of 15 units (including one each in Algebra and Plane Geometry), may be admitted as regular students and candidates for the Associate in Science, Associate in Engineering, or Bachelor of Engineering Technology degree.

**Conditioned Students.** Applicants who do not meet the full requirements for admission as regular students may, at the discretion of the Committee on Admissions, be admitted as conditioned students provided the secondary school work embraces one unit each of Algebra and Plane Geometry. A candidate deficient in Algebra and/or Plane Geometry will be classified as a "conditioned student." He must complete 10.301 and 10.302, Introductory Mathematics, before registering for the first-year program and being reclassified as a "regular student." Such a student may not have the privilege of the Placement Test.

A conditioned student whose scholarship is satisfactory but who has not removed his conditions within the time limit specified by the Committee on Admissions may be permitted to continue his program of studies, but on completion of the curriculum will receive a diploma indicating completion of the program, but not carrying the award of a degree.

Every conditioned student must petition the Committee on Education for reclassification.

**Special Students.** Applicants wishing to pursue a single course or individualized programs may be admitted as special students, not candidates for a degree, provided their previous education and training are the equivalent of the prerequisites for the courses in which they wish to enroll.

Programs may be planned to meet individual needs to provide rapid and immediate knowledge of certain disciplines, to supplement previous training, or to obtain preparation permitting entrance into a new line of endeavor.

### ACADEMIC BACKGROUND

A firm knowledge of the fundamentals of mathematics and science is the foundation upon which successful achievements in the more advanced technological courses are built.

Applicants to Lincoln College are, in many cases, mature adults who, although they have firm backgrounds in industry or previous education, have been away from formal study for some time and, therefore, have doubts concerning their study habits and their algebra, geometry and science proficiency. Those who anticipate some difficulty in adjusting to the first-year course requirements are advised to give very serious consideration to enrolling in non-credit courses in Introductory Mathematics, Introductory Physics, and/or Introductory Chemistry. These courses are designed to develop appropriate background for the basic courses in the degree programs.

## MATHEMATICS PLACEMENT TEST

Applicants requesting admission to regular first-year mathematics are required to demonstrate satisfactory proficiency in Introductory Mathematics through the Lincoln College Mathematics Placement Test. Students who request enrollment in the non-credit Introductory Mathematics course are not required to take the test. Applicants deficient in high school Algebra and/or Plane Geometry are not eligible to take the test but must complete 10.301 and 10.302 Introductory Mathematics I, II to remove the deficiency.

Students who demonstrate satisfactory proficiency in the test will be assigned to the prescribed first-year mathematics sequence. The student may complete his schedule of courses by enrolling in Physics, General Chemistry or Engineering Graphics as his degree program requires.

If need for a strengthening of mathematical background is indicated, the applicant will be assigned to the Introductory Mathematics course. Students enrolling in Introductory Mathematics may fill out their schedule by enrolling in Introductory Physics, Introductory Chemistry, Engineering Graphics or General Chemistry.

In every case the student should carefully consider his combined work and study load and register only for those courses which contribute to the development of a firm knowledge of fundamentals and which enable him to adjust to academic study requirements.

## TRANSFER STUDENTS AND ADVANCED STANDING CREDITS

Students admitted with transfer or advanced standing credits from another institution must meet the requirements for admission as set forth under the regulations applicable to regular students. Advanced standing in the Lincoln College may be obtained by (1) Transfer of Credits or (2) Proficiency Examination.

**Transfer of Credits.** Subject to the approval of the Committee on Admissions, credits may be awarded for academic work completed in other approved schools, colleges or universities if the following criteria are met: (a) the content of the course being submitted is equivalent to that of the corresponding course in the Lincoln College; (b) the average grade achieved in the course submitted is "C" or higher, and (c) the remoteness of the time of study does not negate its use as a prerequisite for an advanced course.

Applicants desiring advanced standing credit by transfer should indicate this desire at the time of filing the application for admission. The applicant should request the Registrar of the institutions of previous attendance to mail an official transcript to the Lincoln College.

**Proficiency Examinations.** Applicants who do not meet all the criteria for the normal transfer of credits but who are able to supply evidence of sufficient knowledge of a subject as a result of previous training or experience may petition the Committee on Admissions for the privilege of taking a Proficiency Examination. If satisfactory proficiency is indicated by the examination, advanced standing credits may be awarded or a substitute course may be recommended.

**Readmission.** Former students, who seek readmission to continue a program of study after having withdrawn from the College for a period of time, may be required to repeat courses which are prerequisites to advanced work.

# **General Registration Information**

## **REGISTRATION FOR COURSES**

Completion of admission requirements does not constitute official registration for courses. All students must be properly registered before attending classes. Registrations are processed by the Registrar's Office during the official registration periods. Former students should ascertain completion of prerequisite courses before registration. Students may register for full-year sequences of courses during the official registration periods. They are urged to register as early as possible in order to facilitate the work of the Registrar's Office.

## **PROGRAM CHANGES**

Changes in program may be made without penalty if initiated before the opening day of classes. Program changes processed later will be charged a Change of Program Fee of \$5.00.

## **OFFICIAL REGISTRATION PERIODS**

Official registration periods are scheduled before the Fall, Winter, Spring and Summer quarters during the academic year. Students are urged to register as early as possible during these periods.

The official dates and times of registration are as follows:

# 1967

## FALL QUARTER REGISTRATION PERIOD

### Boston

Seniors . . . . .	5:30– 9:00 p.m. . . . .	September 5
Former students . . . . .	5:30– 9:00 p.m. . . . .	September 6–8
	9:00–12:00 noon . . . . .	September 9
New Students . . . . .	5:30– 9:00 p.m. . . . .	September 11–15
	9:00–12:00 noon . . . . .	September 16
Burlington . . . . .	12:00– 8:30 p.m. . . . .	August 29, 30, 31
	5:30– 9:00 p.m. . . . .	September 12 and 14
Weymouth . . . . .	5:30– 9:00 p.m. . . . .	September 5, 6, 7
Framingham . . . . .	5:30– 9:00 p.m. . . . .	September 5, 6, 7

## WINTER QUARTER REGISTRATION PERIOD

Boston . . . . .	5:30– 9:00 p.m. . . . .	December 4–8
	9:00–12:00 noon . . . . .	December 9
Burlington . . . . .	12:00– 8:30 p.m. . . . .	December 1
Weymouth . . . . .	5:30– 9:00 p.m. . . . .	December 5
Framingham . . . . .	5:30– 9:00 p.m. . . . .	December 7

# 1968

## SPRING QUARTER REGISTRATION PERIOD

Boston . . . . .	5:30– 9:00 p.m. . . . .	March 4–8
	9:00–12:00 noon . . . . .	March 9
Burlington . . . . .	12:00– 8:30 p.m. . . . .	March 1
Weymouth . . . . .	5:30– 9:00 p.m. . . . .	March 5
Framingham . . . . .	5:30– 9:00 p.m. . . . .	March 7

## SUMMER QUARTER REGISTRATION PERIOD

### Entire Summer Quarter

Boston . . . . .	4:30– 9:00 p.m. . . . .	June 10–14
	9:00–12:00 noon . . . . .	June 15
Burlington . . . . .	12:00– 8:30 p.m. . . . .	June 11

### Summer Quarter II and Summer Quarter B (six weeks)

Boston . . . . .	12:00– 8:30 p.m. . . . .	July 15
	12:00– 8:30 p.m. . . . .	July 29
Burlington . . . . .	12:00– 8:30 p.m. . . . .	July 15

### Summer Quarter III

Boston . . . . .	12:00– 8:30 p.m. . . . .	August 12
Burlington . . . . .	12:00– 8:30 p.m. . . . .	August 12

# **General Academic Information**

## **CAMPUSES**

All courses are offered at the Huntington Avenue Campus, Boston, with a limited number of offerings available at the Suburban Campus, Burlington, and at other locations.

## **THE QUARTER CALENDAR**

The regular school year, from September to June, is divided into three quarters of 13 weeks each. Twelve weeks are scheduled for instruction and final examinations with one week available for make-up classes or vacation time. A limited program of courses is offered during the summer quarter.

## **LIBRARY AND STUDY AREAS**

The UNIVERSITY LIBRARY is well equipped in technical literature and is available for use of students of the College. The reading rooms are open from 8:00 a.m. to 10:00 p.m. Monday through Thursday, from 8:00 a.m. to 7:30 p.m. on Friday, and from 8:30 a.m. to 4:00 p.m. on Saturday. In addition, the Richardson Reading Room is open until 11:00 p.m. Monday through Thursday and until 10:00 p.m. on Friday. This room is also open on Sunday from 1:00–5:00 p.m. The privilege of obtaining books from the Boston Public Library is extended to students of the College. Application for this privilege, which involves a fee, should be made directly to the Boston Public Library.

Study areas are also available in the Ell Student Center Building.

## **INSTRUCTION**

**Class Sessions.** Lecture periods consist of one hour and forty-minute sessions beginning at about 6:30 p.m. or 8:15 p.m. each weekday evening and at 9:00 a.m. or 11:00 a.m. on Saturdays. Design and laboratory courses are of longer duration and may occupy a full evening.

**Regular Course Work.** All of the usual methods of instruction are employed—lectures, home assignments, class projects, laboratory work, irregularly scheduled quizzes, and formal examinations. In addition, mid-course examinations are scheduled in most courses and a final examination is required at the completion of all courses. Students are responsible for fulfilling all the requirements of a course. In the event of absence, students must make appropriate arrangements for makeup with the instructor.

## ATTENDANCE

Students absent from regularly scheduled sessions in any subject, for whatever reason, may seriously jeopardize their academic progress and status. Students are expected to be in attendance at all the sessions scheduled in their courses. Excessive absence may cause the removal of the subject(s) from the student's schedule.

## WITHDRAWAL

Simply ceasing to attend classes or notifying the instructor does not constitute official withdrawal from a course. To officially withdraw from a course, the student must notify the Registrar's Office and complete the appropriate withdrawal form. Properly registered students who do not attend the first or second session in any course will be automatically withdrawn from the class roll.

## MAKEUP EXAMINATIONS

**Mid-Course Examinations.** A student absent from a regularly scheduled mid-course examination may petition for a makeup examination. This is a privilege which may be denied if abused by an excessive number of petitions or other reasons.

Students applying for makeup examinations must observe the following procedure:

1. Obtain a petition from the Lincoln College Office.
2. Complete it in detail and pay the required Makeup Examination Fee of \$3 at the Bursar's Office.
3. File the original petition in the Lincoln College Office and retain countersigned student's copy.

Makeup mid-term examinations will be given on a Saturday at 1:00 p.m. in a designated room.

Petitions must be filed in accordance with the schedule listed below:

Examination Missed During	File Petition No Later Than	Date Scheduled
Fall Quarter	Nov. 10, 1967	Dec. 2, 1967
Winter Quarter	Feb. 10, 1968	Feb. 24, 1968
Spring Quarter	May 11, 1968	May 25, 1968

In the event that an absence from a mid-term examination is known in advance, a petition may be filed beforehand. No petition will be accepted for any reason after the dates specified.

Any student who does not take the makeup examination as scheduled will forfeit the makeup privilege.

**Final Examinations.** If a student is absent from a final examination, he will receive a grade of "I" (Incomplete) in the course. He may petition for a makeup final examination at the Registrar's Office, 120 Hayden Hall.

The student must pay a fee of \$5 at the time the petition is filed with the Registrar for taking the special final examination. Petitions for makeup final examinations must be filed in accordance with the schedule listed below:

Final Examination Missed During	File Petition No Later Than	Makeup Final Examination During Week of
Fall Quarter	Dec. 30, 1967	Jan. 22, 1968
Winter Quarter	Mar. 30, 1968	April 22, 1968
Spring Quarter	June 29, 1968	July 22, 1968
Summer Quarter	Oct. 5, 1968	Oct. 28, 1968

Students will be notified by mail when and where to take the missed final examination. All makeup examinations will be given on the Boston Campus. Students who do not take makeup final examinations as scheduled forfeit the makeup privilege.

### GRADING SYSTEM

The following system of grading is used. The numerical equivalent for each grade is in parentheses.

A (4.0)—Outstanding	D (1.0)—Poor
B (3.0)—Good	F (0.0)—Failure
C (2.0)—Satisfactory	I (—)—Incomplete

A general average of "D" is unacceptable and will not allow a student to continue in Lincoln College or to receive a degree from Northeastern University. The "F" grade is a definite failure and requires repetition of course in its entirety. The "I" grade is given only when the student fails to take the final examination.

### GRADE REPORTS

A report of the student's standing is issued at the end of each quarter. Grades are mailed to the student by the Registrar and will not be given out at the office of either the Registrar or Lincoln College. Under no circumstances will grades be given over the telephone.

### ACADEMIC STANDARDS

Students are required to maintain an appropriate quality-point average in course work and to complete the quantitative-credit requirements of his program of study to satisfy academic progress criteria and achieve graduation from Lincoln College.

**Quality-Point Average.** The quality points earned by the student in a given course are determined on the basis of the letter-grade achieved and the number of credit hours carried by the course. The total quality points earned

divided by the total number of credit hours constitutes the quality-point average.

- When the student has more than one grade in the same course, the most recent grade will be used in the calculation of the quality-point average.
- A grade of "I" will not be considered in the calculation of the quality-point average.
- Although advanced standing credits (ASC) allowed for acceptable work completed at other institutions by transfer students count toward completion of the quantitative credit requirements, neither the credits nor the grades earned in such courses are included in quality-point average computations.

For example, a student who has registered for seven courses, cleared a failure in one of them and received advanced standing credit (ASC) in another, may calculate his quality-point average as follows:

Grade Achieved	Numerical Equivalent	Credit Hours	Quality Points
A	4.0	x 4 =	16.0
B	3.0	x 4 =	12.0
C	2.0	x 3 =	6.0
D	1.0	x 3 =	3.0
F	0.0	x 2 =	0.0
<del>F</del> B	3.0	x 2 =	6.0
I	—	x — =	—
ASC	—	x — =	—
Totals		18	43.0

$$\text{Quality-Point Average} = \frac{\text{Total Quality Points (43.0)}}{\text{Total Credit Hours (18)}} = 2.389$$

**Academic Progress Criteria.** It is expected that the student will at all times endeavor to achieve a high record of achievement. The Committee on Education reserves the right to review all students' records and deny readmission to those who fall below a minimum quality level of achievement. This requirement has been established as follows:

In order to be allowed to remain in the College, a student must have achieved a quality-point average of 1.2 at the completion of 24 quarter hours; 1.4 at the end of 48 quarter hours; and 1.6 at the end of 72 quarter hours. A quality-point average of 1.75 is required for graduation with the Associate in Engineering or Associate in Science degrees (96 Q.H.) and 1.80 for graduation with the Bachelor of Engineering Technology degree. (180 Q.H.)

It should be further noted that a student who accumulates the equivalent of six uncleared failures may be considered ineligible to continue his program of study.

The Registrar's Office, 120 Hayden Hall, will not be able to recalculate or confirm the calculations of quality point averages for individual students. Each student's record will be brought up to date before his graduation. In the meantime, borderline cases will be checked by the Lincoln College Committee on Education.

### PROBATION

**Scholastic Probation.** The Committee on Education has the authority to dismiss from the College or place on scholastic probation any student whose

scholarship is deficient for the following reasons: low quality-point average, excessive outstanding failures regardless of quality-point average.

A student on Scholastic Probation should be particularly diligent in his current courses and make every effort to clear his academic deficiencies as soon as possible. Students whose academic record does not improve or whose failures are not properly cleared may not be allowed to register for further courses.

When a student on Scholastic Probation has cleared all or a substantial part of his outstanding failures he may petition the Committee on Education for removal from the probation list.

**Disciplinary Probation.** The Committee on Education has the authority to dismiss from the College or place on Disciplinary Probation any student whom it may deem unworthy because of conduct or character. The Committee may ask any student to withdraw from the College who is obviously out of sympathy with its aims and ideals.

### GRADUATION REQUIREMENTS

To receive the degree of Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology, the student must fulfill the following requirements:

1. Complete all the courses of his particular curriculum, either by attendance at the Lincoln College or by receiving Advanced Standing Credit.
2. Complete associate-degree programs in eight years and bachelor's programs in 12 years from the date of entrance into Lincoln College. Extensions of time may be granted by the Committee on Education.
3. Be in attendance for at least a year preceding the date on which he expects to graduate; that is, he must complete at least one full year's work in Lincoln College.
4. Achieve a quality-point average of at least 1.75 in courses taken in the College to be awarded the Associate in Engineering or Associate in Science degrees and 1.80 for the Bachelor of Engineering Technology degree.
5. Pay the Graduation Fee of \$25.

**Graduation With Honor.** Upon graduation, honors will be conferred upon students achieving the following quality-point averages: 3.00 Honor, 3.50 High Honor, 3.75 Highest Honor. In order to be eligible for honor graduation, a student must have completed at least half of the credits required for graduation in Lincoln College.

**Attendance At Commencement.** All candidates for a first degree (bachelor or associate) are required to attend Commencement in the year of qualification. First degrees in absentia are awarded only to candidates excused for personal or immediate family illness, military service, or obligations beyond the control of the candidate.

A petition to receive a degree in absentia must be presented to the Dean of the College.

# **General Financial Information**

Students are expected to meet their financial obligations to the University or to make satisfactory arrangements with the Bursar's Office in order to be permitted to attend class sessions, to advance in class standing, to re-enroll after withdrawal, or to be conferred a degree. A certificate of honorable dismissal will be issued only to students who have a satisfactory financial standing. Checks should be drawn payable to Northeastern University.

## **INITIAL REGISTRATION FEE**

An initial registration fee of \$10 must accompany the student's initial registration for admission to the University. This fee is non-refundable.

## **CHANGE OF PROGRAM FEE**

Students are urged to register and make changes in their registrations early during the official registration period before the beginning of each quarter. Program changes processed after the close of the official registration period for each quarter will be charged a fee of \$5.

## **TUITION**

Tuition for Lincoln College credit courses is charged at the rate of \$17 per quarter hour of credit at the Huntington Avenue Campus (Boston) and at the rate of \$19.50 per quarter hour of credit at the Suburban Campus (Burlington). Non-credit courses are charged at rates comparable to those of credit courses meeting on an equivalent contact-hour schedule.

Tuition, payable each quarter, is dependent upon the number of courses in which the student is enrolled, the quarter-hour credits awarded for each course, and the campus at which the course is offered. The following schedule indicates the tuition per quarter for courses offered by Lincoln College:

**Course Tuition Per Quarter**

<b>Course Credits</b>	<b>Boston Campus (\$17.00 per Q.H.)</b>	<b>Suburban Campus (\$19.50 per Q.H.)</b>
2 Q.H.	\$34.00	\$39.00
3 Q.H.	\$51.00	\$58.50
4 Q.H.	\$68.00	\$78.00

Tuition for all courses is charged on a quarter basis and is payable in full at the beginning of each quarter. As a convenience without additional charge, and at the student's request, the Bursar's Office will allow payment in two installments.

**DEFERRED-PAYMENT PRIVILEGE**

Occasionally situations develop, usually beyond the control of the student, which make it difficult to meet payments in the regular manner. Under such circumstances the student is advised to discuss his problem personally with the Bursar's Office where a convenient deferred payment agreement can be worked out. A service fee of \$2 is charged for this privilege.

**LATE-PAYMENT FEE**

Payments of tuition are due by Saturday of the week in which the bill is dated. If payment is not made, or a deferred payment agreement arranged by that date, a late fee of \$5 is charged by the Bursar.

**REFUND OF TUITION**

The University provides all instruction and accommodations on an academic quarter basis; therefore, no refunds are granted except in cases in which students are compelled to withdraw because of personal illness or other reason beyond their control. In no event will a refund be made if the individual's attendance is recorded beyond the fifth class session. A student must complete an official withdrawal application before being considered for refund. Questions regarding refunds should be discussed with the Bursar's Office.

**TUITION UNDERWRITTEN BY EMPLOYERS**

An increasing number of companies are underwriting part or all of the cost of tuition of students in their employ. In cases in which payment is made directly by the employer to the University, the student should furnish the Bursar's Office a purchase order covering his registration or a statement from an officer of his company certifying that the company is underwriting the tuition.

**STUDENT CENTER FEE**

Students attending the Boston Campus will be assessed a Student Center Fee of 75¢ per quarter.

## LABORATORY FEES

All students taking a chemistry laboratory course which includes laboratory must purchase from the Bursar's Office a Laboratory Fee and Deposit Card for \$15. Upon completion of the course or withdrawal during the quarter, the student must check out his locker with the stockroom attendant. The Bursar's Office will then refund any unused balance shown on the Laboratory Fee and Deposit Card.

## MAKEUP MID-TERM EXAMINATION FEE

Students absent from a regularly scheduled mid-term examination during a course may petition for a makeup. The fee for each test requested by the student is \$3. The fee must be paid when the petition is filed in the Lincoln College Office.

## SPECIAL FINAL EXAMINATION FEE

Students absent from the regularly scheduled final examination at the end of a course may petition for a "special final examination." The fee for each examination requested by the student is \$5. The fee must be paid when the petition is filed in the University Registrar's Office.

## PROFICIENCY EXAMINATION FEE

Applicants for admission may petition to be awarded advanced standing on the basis of achievement demonstrated by a "proficiency examination." The fee for each examination requested by the applicant is \$10. The fee must be paid when the petition is filed in the Lincoln College Office.

## GRADUATION FEE

The University graduation fee, charged to those who are candidates for the associate or bachelor's degree, is \$25, payable on or before May 1 of the year in which the student expects to graduate.

## TRANSCRIPT OF RECORD FEE

Students may request transcripts of their records at the University Registrar's Office. There is no charge for the first transcript. After the initial transcript there is a charge of \$1 per copy.

## TEXTBOOKS AND SUPPLIES

Students purchase their own textbooks and work materials. The cost varies according to the subject for which the student is enrolled. The average cost for a normal program of four subjects generally range from \$20 to \$30. Textbooks for single courses range from \$4 to \$15.

Students enrolled in Engineering Graphics should be prepared to spend \$15 to \$20 for drawing supplies and \$20 to \$25 for a set of drawing instruments in addition to the textbooks.

## LOAN PROGRAMS

### National Defense Student Loan Program

Any student in good standing who can demonstrate financial need is eligible to apply to the Director of Financial Aid for Students at Northeastern for assistance under the National Defense Student Loan Program. Recipients of the loans are selected by the University. The law requires that each borrower be at least a half-time student, in need of the amount of the loan, and capable of maintaining a good standing in his chosen course of study.

A student may borrow up to \$1,000 in one year, and a maximum of \$5,000 during his entire college career. Special consideration is given to superior students.

Loans to students who plan to teach in elementary and secondary schools or in institutions of higher education after graduation will be canceled up to a maximum of 50 per cent at the rate of 10 per cent for each year of such teaching. No interest is charged on loans until one year after graduation. Thereafter, interest is paid at the rate of 3 per cent per year. Borrowers may have up to 10 years to repay.

### Higher Education Loan Plan (HELP)

The Massachusetts Higher Education Assistance Corporation was chartered in 1956 by the Massachusetts legislature to aid young men and women of the state to complete their programs of higher education. Students who are residents of Massachusetts and who have satisfactorily completed the freshman year are eligible for HELP loans. Loans are generally limited to \$1,000 in any one academic year, with an over-all limitation of \$3,000.

Full information and the required application forms may be obtained from any of the national banks and trust companies in Massachusetts participating in the program.

This plan is also used by most other states and Canada to provide assistance for undergraduate or graduate students. In New York, New Jersey, and Rhode Island, freshmen are eligible to borrow under this program. Students should check with their state Higher Education Assistance Corporation for further details.

### University Long-Term Loan Fund

Northeastern maintains a loan fund for the purpose of aiding students in meeting their tuition expenses from quarter to quarter.

This fund is in many ways similar to the National Defense Loan Fund. Money borrowed need not be repaid until after graduation; and interest, at the rate of 3 per cent, does not become effective until one year after that time.

Students who qualify for this assistance may borrow as much as full tuition for any given quarter.

### The New England Society Student Loaning Fund

The purpose of this revolving Student Loaning Fund, established by the New England Society, is to make available to deserving students, especially those of New England birth or ancestry, small amounts of money as temporary loans to meet emergencies.

It is not intended to be used for large loans to cover scholarships, board, or room rent, or for loans which will be outstanding more than three months.



# ***Student and Alumni Information***

## **STUDENT ACTIVITIES**

Student activities in the College are planned, organized and operated by the student body to keep pace with changing student needs as well as to provide maximum opportunity for student participation. The program is flexible in nature and pioneering in spirit to meet the needs of adult students. The program is dedicated to assisting the adult student in the development of his fullest potential.

The purposes of evening student activities are: (1) To encourage and reward scholarship, (2) To provide opportunities for the development and pursuit of cultural interests and professional objectives, (3) To encourage the development of leadership activities and skills, (4) To enable the student to identify more closely with the University, (5) To include the family as an important and vital motivating force in the evening student's educational career.

**Student Activities Council.** The Student Activities Council is in charge of the social and extracurricular life of the College. The Council, consisting of representatives from the various classes, sponsors social coffee hours, student dances, and an annual Christmas Party for the children of students, and assists in Class Day exercises, student orientation, and other projects.

The Council represents the interests of the student body and acts as an advisory group in student affairs. The faculty and administration consult with the Council in regard to University policies.

The Student Orientation Committee publishes a Student Handbook which is distributed to all students and sponsors an orientation program each fall for new students.

## ALUMNI ASSOCIATION

More than 37,000 alumni are members of the all-University Alumni Association, which has as its prime purposes the promotion of the welfare of Northeastern University, the establishment of a mutually beneficial relationship between the University and its alumni, and the perpetuation of fellowship among members of the Association.

The Association headquarters and Alumni Lounge are located in Rooms 225 and 226 Richards Hall, respectively. The official records and addresses of alumni are maintained in Room 20 of the Forsyth Annex.

The official publication of the Alumni Association, **The Northeastern University ALUMNUS**, is published quarterly and sent free of charge to all alumni on record.

Activities of the Association, including the Homecoming Day celebration and the annual presentation of Professional Promise Awards to outstanding seniors in each of the Colleges, are directed by the Vice President for Alumni Affairs. Alumni officers also attend meetings of undergraduate classes to form a closer relationship between the Association and its future members.

The Alumni Relations Office assists the various class officers in planning class reunions. Each class normally holds a reunion every five years during the month of June. The Vice President for the Alumni Class Council is responsible for co-ordinating class activities and organizing class functions.

The Vice President for Alumni Clubs works in close association with officers of the more than 40 Regional Alumni Clubs which have been established from coast to coast. All alumni are eligible to become members of these organizations. The alumni clubs meet periodically, often in conjunction with visits from members of the faculty or with athletic events.

For Boston area alumni, monthly luncheon meetings are held in both the downtown and uptown sections of the city.

The Association also sponsors and assists the alumnae organization, and the Varsity Club, both of which have their own officers and conduct various programs throughout the year. Through the Varsity Club, the Association presents trophies to the outstanding athlete of the year in each of the six major sports.

The Northeastern University Alumni Association is a member of the American Alumni Council, a professional organization composed of representatives of all major colleges and universities in the United States and Canada.

## ALUMNI RELATIONS

The Alumni Association is providing a uniquely valuable service to both the University and the community by sponsoring admissions conferences for parents of high school students who are interested in attending college. These meetings, held in cooperation with the Northeastern Department of

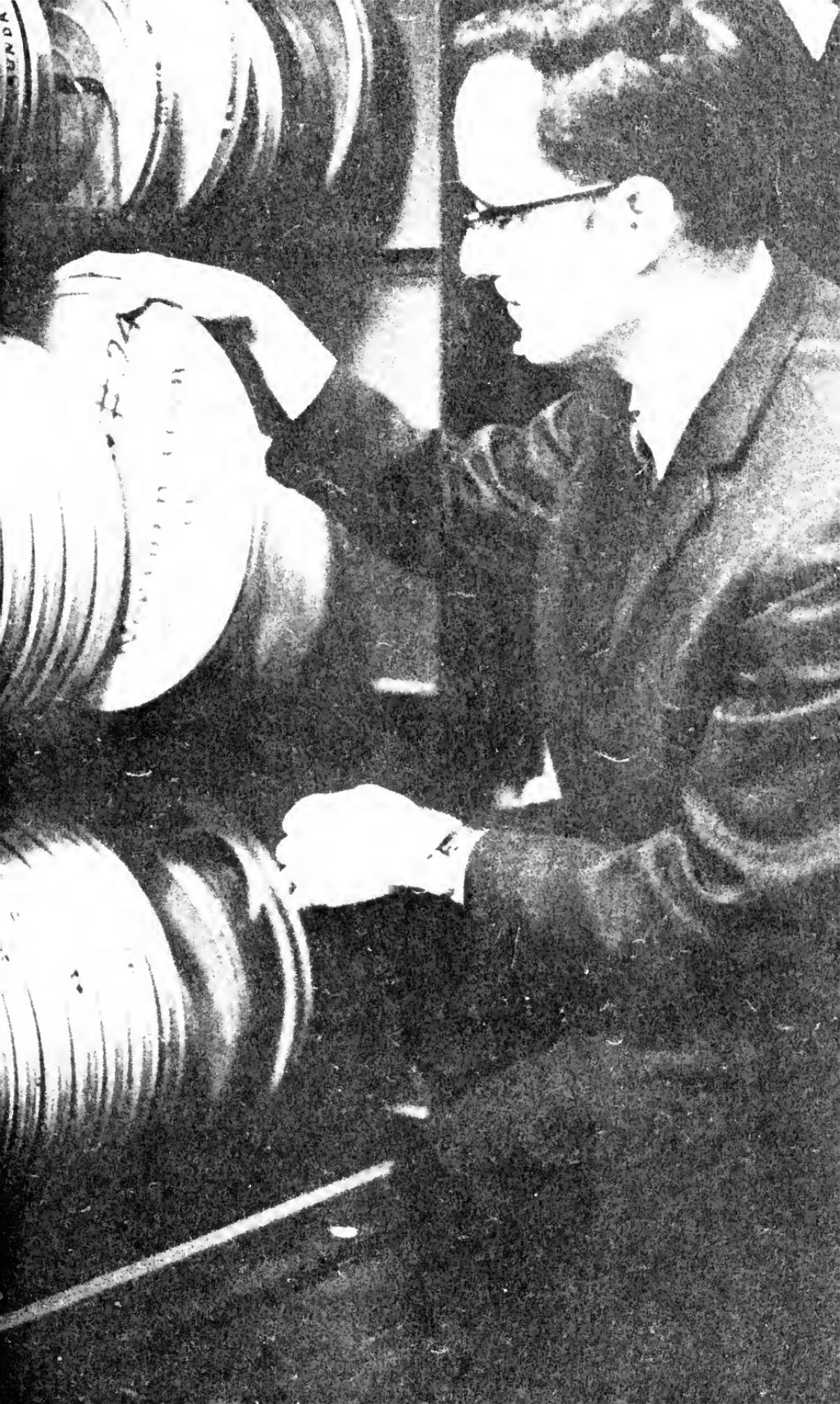
Admissions, have been extremely well attended. Local residents as well as alumni of the University have been invited to these conferences, which help to clarify many of the questions today's parents and young people have concerning application procedures of colleges and universities.

### PLACEMENT SERVICE

Many requests from employers are received by the College, for men and women of potential ability to fill important positions of responsibility. It is the policy of the College to serve the students whenever possible by placing them in those positions which promise attractive opportunities for development and advancement. The College, however, cannot guarantee to place its students, but it does endeavor to keep in close touch with those who desire placement service and to assist them in obtaining satisfactory advancements in positions and income. No charge is made for placement service. Those needing this assistance should arrange an appointment with the Director of Placement.

While the College cannot guarantee positions to its graduates, the number of requests usually exceeds the number available in the graduating class of any given year. The policy of the College is to find the best equipped and qualified men and women among its graduates for the positions which the College is called upon to fill.

The College, in recommending a graduate for a position, furnishes the prospective employer with the facts as to the graduate's ability, character, attitudes, habits, and other qualifications for the position as revealed by the College records. In the last analysis, however, placement in a position depends largely upon the graduate's ability to sell his services to the prospective employer. Most employers prefer to consider two or more candidates for a position and generally request the College to suggest more than one person. Many manufacturing and commercial firms throughout New England call upon the College to assist them in filling important executive and managerial positions.



# **Programs of Instruction**

## **DEGREES AND CERTIFICATES**

Lincoln College conducts educational programs on the undergraduate level in various technological areas leading to the following degrees and certificates:

1. Associate in Science degree (A.S.) requiring 96 quarter hours of credit.
2. Associate in Engineering degree (A.E.) requiring 96 quarter hours of credit.
3. Bachelor of Engineering Technology degree (B.E.T.) requiring 180 quarter hours of credit.
4. Certificates may be earned with a minimum of 24 quarter hours of credit. Special programs or single courses are available for special students.

Lincoln College collaborates with University College in programs leading to:

1. Bachelor of Science degree (B.S.) requiring 174 to 180 quarter hours of credit.

## **ASSOCIATE-DEGREE GRADUATES**

Graduates of the Engineering or Science Technology programs in Lincoln College, or other similar colleges and institutions, who have earned the Associate in Engineering or the Associate in Science degrees, may transfer applicable credits toward the degree requirements in the baccalaureate programs in Engineering Technology, Medical Technology or Industrial Technology.

Those who have maintained a quality point average of 2.500 or higher in the associate-degree programs may transfer to either of the following College of Engineering curricula: (1) day-college Co-operative Education programs in Civil, Mechanical, Electrical, Industrial or Chemical Engineering with credit for the first year of the five-year program, or (2) the part-time evening programs in Civil or Electrical Engineering with credit for the first two years of the eight-year programs.

## **TRANSFER STUDENTS**

Students transferring from community colleges, junior colleges, technical institutes, or other colleges and universities may transfer applicable credits toward the degree requirements of Lincoln College.

## FOUNDATIONS FOR TECHNOLOGY

### (Non-Credit)

Beginning students, who have been away from formal study for some time, frequently are concerned about their study habits and their mathematics and science backgrounds. Applicants who anticipate some problems in adjusting to college study are advised to give serious consideration to enrolling in the non-credit introductory course, the reading improvement program or doing review work through programmed instruction.

#### **Introductory Courses**

These courses are designed to develop background for basic courses in the degree programs and thus increase the probability of successful achievement in advanced technology courses.

**Introductory Mathematics I and II.** A two-quarter review of high school Algebra I and some plane geometry. These courses are required of students who do not demonstrate sufficient algebra proficiency on the Mathematics Placement Test. (See course description for 10.301 and 10.302, pages 111-112.)

**Introductory Physics I and II.** A two-quarter relatively non-mathematical introduction to the concepts of physics designed to prepare students for the credit sequence in Physics. (See course description for 11.301 and 11.302, page 113.)

**Introductory Chemistry I and II.** A two-quarter relatively non-mathematical introduction to the concepts of chemistry designed to prepare students for the credit sequence in General Chemistry. (See course description for 12.301 and 12.302, page 115.)

#### **Reading Improvement**

The ability to read well is one of the most important basic tools for the successful completion of a college program. The University's Center for Reading Improvement gives the student an opportunity to develop good reading habits in preparation for the intensive reading assignments of college level courses. The following core skills are covered: previewing, locating main ideas and related details, using guide words and phrases, identifying structural patterns, outlining and summarizing, note-taking, vocabulary building, skimming and scanning, speed-reading and critical reading.

Further information may be obtained at the Center for Reading Improvement.

#### **Programmed Study**

Students may enroll in non-credit, self-study courses to better prepare themselves for college academic work and strengthen their high school background at the University's Center for Programmed Study.

Courses which may be useful to students in the Lincoln College programs in technology are:

Slide Rule	Trigonometry	Effective Listening	Spelling
Algebra	Study Skills	Calculus	English

The Center is open Monday through Thursday from 8 a.m. to 10 p.m.; Friday from 8 a.m. to 6 p.m.; Saturday from 8:30 a.m. to 12:30 p.m.; and Sunday from 1 p.m. to 5 p.m. Descriptions and full information may be obtained at the Center for Programmed Study.



## **SCIENCE TECHNOLOGY PROGRAMS**

The Science Technology programs offered by Lincoln College present a variety of interdisciplinary combinations of the theoretical and basic sciences (biology, chemistry, mathematics, physics) rather than the applied and engineering sciences, emphasized in the Engineering Technology programs. In contrast to the Engineering Technology programs which concentrate heavily on application, design, efficiency and cost, the Science Technology curricula devote more courses to theoretical concepts, analytical methods and laboratory investigating techniques. Where employment opportunities for the engineering technologist lie in organizations and industries concerned with present-day engineering, design, and production methods, the science technologist will find his opportunities concerned with the frontiers of knowledge and the newly emerging sciences.

Organizations dealing with nuclear, environmental, meteorological, oceanographic, chemical and physical research as well as the pharmaceutical, hospital clinical laboratories or agencies concerned with health and medicine are likely places of employment.

### **General Science Teaching Option**

Graduates of the baccalaureate program in Chemical-Biological Technology, who have maintained a quality point average of 2.300 or higher and have included courses in Adolescent Psychology and Principles of Teaching among their electives may apply for admission to the Northeastern University Graduate School of Education in which requirements for teacher certification and the Master of Education degree may be completed.

The Science Technology related programs offered by Lincoln College are:

### **Associate in Science Degree**

Chemical-Biological Technology .....	page 52
Chemical-Physical Technology .....	page 53
Mathematical-Physical Technology .....	page 54

### **Bachelor of Science Degree**

Chemical-Biological Technology .....	pages 55-56
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**CHEMICAL-BIOLOGICAL TECHNOLOGY****Leading to the Degree of Associate in Science**

The program in Chemical-Biological Technology provides the chemistry and biology foundation required by medical and industrial laboratory assistants and technicians in clinically, chemically or biologically oriented organizations, and for persons having various paramedically related responsibilities. Employment opportunities are in general hospitals, health clinics, research foundations, chemical and drug industries, public health organizations, water and sanitation departments; and in the emerging fields of the oceanographic technologies.

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6
12.314, 315, 316	General Chemistry and Lab. I, II, III	9

**SECOND YEAR**

10.321, 322, 323	Calculus I, II, III or	6
39.511, 512, 513	Statistics I, II, III	
12.321, 322, 323	Analytical Chemistry I, II, III	6
12.324, 325, 326	Analytical Chemistry Lab. I, II, III	6
09.351, 352, 353	Principles of Computer Programming I, II, III	6

**THIRD YEAR**

12.331, 332, 333	Organic Chemistry I, II, III	6
12.334, 335, 336	Organic Chemistry Lab. I, II, III	6
18.311, 312, 313	General Biology and Lab. I, II, III	12

**FOURTH YEAR**

18.321, 322, 323	Microbiology and Lab. I, II, III	12
73.311, 312, 313	Clinical Biochemical Technology I, II, III	12

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**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**CHEMICAL-PHYSICAL TECHNOLOGY****Leading to the Degree of Associate in Science**

The program in Chemical-Physical Technology prepares the graduate to assume responsibilities related to the analysis, synthesis and production of products involving chemical as well as physical changes. The curriculum provides both theoretical and laboratory training in the traditional branches of chemistry but also includes modern instrumental, radio chemistry and nuclear technology. It provides broad rather than specialized training so as to have applicability in many chemistry-related fields. Employment opportunities are in manufacturing and pharmaceutical plants producing drugs, oils, synthetics and plastics; as well as in private and industrial research laboratories concerned with the development of processes, by-products and new knowledge.

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6
12.314, 315, 316	General Chemistry and Lab. I, II, III	9

**SECOND YEAR**

10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6
12.321, 322, 323	Analytical Chemistry I, II, III	6
12.324, 325, 326	Analytical Chemistry Lab. I, II, III	6

**THIRD YEAR**

09.351, 352, 353	Principles of Computer Programming I, II, III	6
11.321, 322, 323	Particles and Waves I, II, III	6
12.331, 332, 333	Organic Chemistry I, II, III	6
12.334, 335, 336	Organic Chemistry Lab. I, II, III	6

**FOURTH YEAR**

12.341, 342, 343	Physical Chemistry I, II, III	6
12.351, 352, 353	Instrumental and Radio Chem. I, II, III	6
12.381, 382, 383	Nuclear Technology I, II, III	6
00.000, 000, 000	Elective I, II, III	6

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**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**MATHEMATICAL-PHYSICAL TECHNOLOGY****Leading to the Degree of Associate in Science**

The program in Mathematical-Physical Technology is designed to establish a firm background in the concepts of physics and mathematics with sufficient chemistry to allow effective communication between technologist and professional. The intensity of courses introduces theoretical depth for concept development but places emphasis at the level of application and performance.

Graduates may serve as high-level technicians and laboratory assistants in such fields as environmental and space science. Working with the professional engineer or scientist, he may assist in performing intricate and detailed experiments; collect, organize and reduce technical data to manageable form for analysis; or perform investigations requiring mathematical and scientific backgrounds. Opportunities exist in the wide spectrum of research and development organizations which deal in the physical, mathematical and engineering sciences.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6
12.314, 315, 316	General Chemistry and Lab. I, II, III	9

**SECOND YEAR**

03.301, 302, 303	Circuit Theory I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6
12.321, 322, 323	Analytical Chemistry I, II, III	6

**THIRD YEAR**

09.351, 352, 353	Principles of Computer Programming I, II, III	6
10.324, 325, 326	Differential Equations I, II, III	6
11.321, 322, 323	Particles and Waves I, II, III	6
00.000, 000, 000	Elective I, II, III	6

**FOURTH YEAR**

10.351, 352, 353	Adv. Mathematics I, II, III	6
11.331, 332, 333	Adv. Physics I, II, III	6
11.341, 342, 343	Physics Laboratory I, II, III	6
00.000, 000, 000	Elective I, II, III	6

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**CHEMICAL-BIOLOGICAL TECHNOLOGY****Leading to the Degree of Bachelor of Science**

The Chemical-Biological Technology program is an interdisciplinary program integrating theoretical and laboratory course sequences from the fields of Chemistry and Biology which prepare the student to assume responsibilities in laboratory careers which emphasize laboratory applications and teaching careers in general science. Employment opportunities are in a wide variety of industrial, pharmaceutical, clinical and hospital laboratories dealing with analytical, production and research functions and in secondary school education in the teaching of general science, chemistry, biology and other related courses.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
30.504, 505, 506	English I, II, III	6
12.314, 315, 316	General Chemistry and Lab. I, II, III	9

**SECOND YEAR**

10.321, 322, 323	Calculus I, II, III or	6
39.511, 512, 513	Statistics I, II, III	6
12.321, 322, 323	Analytical Chemistry I, II, III	6
12.324, 325, 326	Analytical Chemistry Lab. I, II, III	6
23.501, 502, 503	Western Civilization I, II, III	6

**THIRD YEAR**

18.311, 312, 313	General Biology and Lab. I, II, III	12
11.304, 305, 306	General Physics I, II, III	6
30.507, 508, 509	Introduction to Literature I, II, III	6

**FOURTH YEAR**

18.314, 315, 316	Botany I, II, III	9
12.331, 332, 333	Organic Chemistry I, II, III	6
12.334, 335, 336	Organic Chemistry Lab. I, II, III	6
39.501, 502, 503	Economic Principles and Problems I, II, III	6

**FIFTH YEAR**

18.321, 322, 323	Microbiology and Lab. I, II, III	12
12.351, 352, 353	Instrumental and Radiochemistry I, II, III	6
00.000, 000, 000	*Elective	6

**SIXTH YEAR**

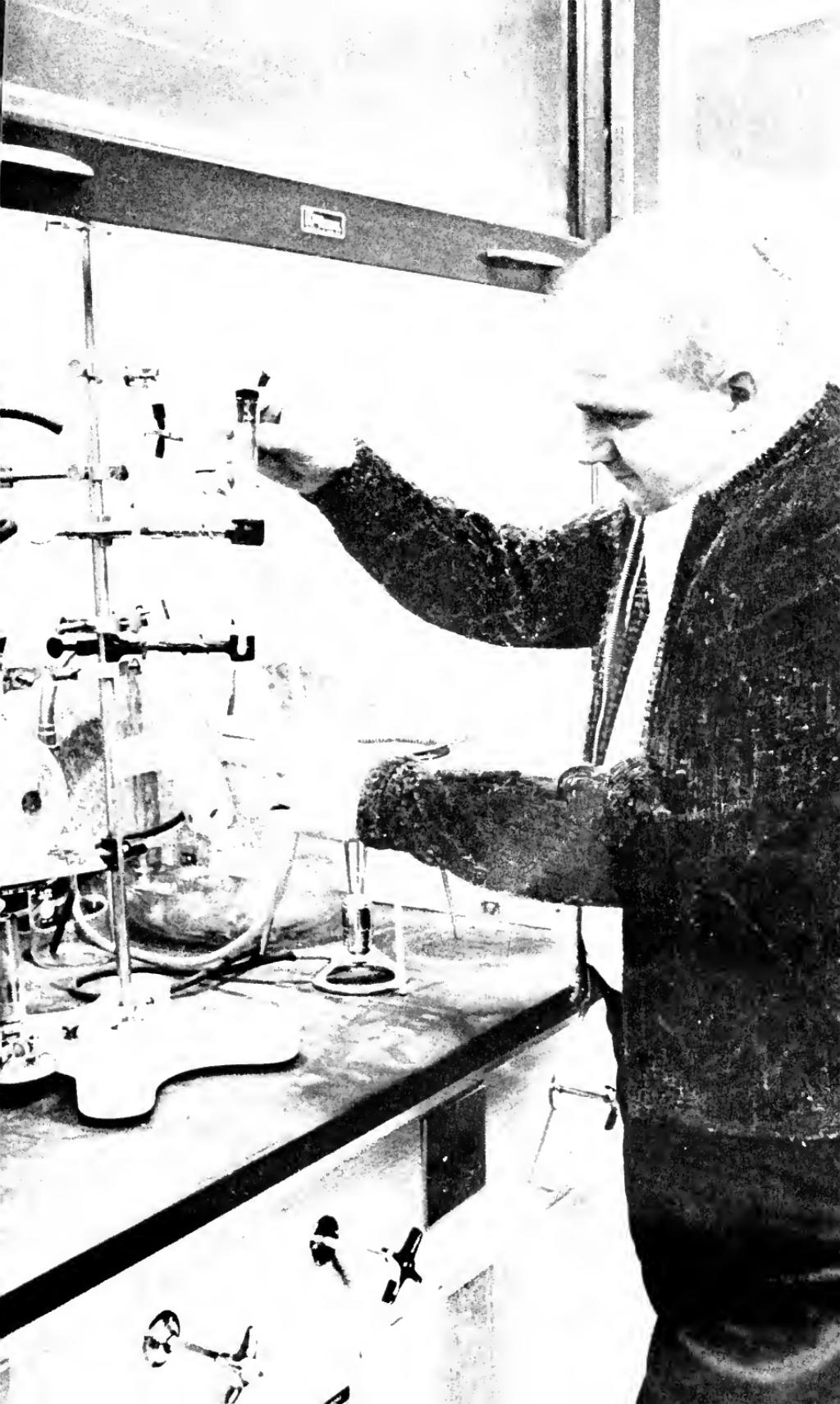
18.324, 325, 326	Anatomy and Physiology I, II, III	6
18.351, 352, 353	Histology-Organology I, II, III	6
21.501, 502, 503	Sociology I, II, III	6
00.000, 000, 000	*Elective	6

**SEVENTH YEAR**

18.357, 358, 359	Genetics I, II, III	6
19.501, 502, 503	Psychology I, II, III	6
16.531, 532, 533	Oceanography I, II, and Marine Geology	6
00.000, 000, 000	*Elective	6



<sup>a</sup>General Science Teacher Option—Students planning to apply to the Northeastern University Graduate School of Education must include courses in Adolescent Psychology and Principles of Teaching among the electives.





## ALLIED-MEDICAL TECHNOLOGY PROGRAMS

The Allied-Medical Technologies encompass the newly emerging category of occupations concerned with the applications of the biological, engineering, natural, and physical sciences in the technological service fields which support the health, medical, and pharmaceutical professions.

The need for competent technological specialists has been created by greater knowledge resulting from biological, chemical, medical, and pharmaceutical research; technological developments in the fields of laboratory analysis, nuclear and radiological technology; and the increased use of sophisticated equipment and electronic instrumentation. The demand for these new technologists exists in hospitals, clinics and public health organizations; biological and pharmaceutical research foundations; the chemical and drug industries; and organizations which design, develop and manufacture equipment for these fields.

In response to this need, Lincoln College has expanded its offerings to include the biology, chemistry and other special clinical technology courses which provide the technological core for the Allied-Medical Technologies.

The Allied-Medical Technology related programs offered by Lincoln College are:

### Associate in Engineering Degree

Bioelectronic Engineering Technology ..... page 60

### Bachelor of Science Degree

Cytotechnology ..... pages 61-62  
Medical Technology ..... pages 63-64

**BIOELECTRONIC ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Bioelectronic Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, and operation of modern medical electronic devices used in the measurement, recording and analysis of anatomical, physiological, and biochemical functions in humans and animals. The curriculum builds heavily on electronics theory, chemistry and human physiology with emphasis on typical bioelectronic devices and their laboratory applications. Employment opportunities are in biological, chemical, physiological and pharmaceutical research laboratories; in clinics and hospitals in relation to medical diagnoses and patient care; as well as in industrial organizations concerned with the design, development and production of the equipment.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I ,II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

03.301, 302, 303	Circuit Theory I, II, III	6
09.351, 352, 353	Principles of Computer Programming I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

03.304, 306, 323	Circuit Theory IV, Electrical Measurements and Electronic Lab.	6
03.311, 312, 313	Electronics I, II, III	12
12.311, 312, 313	*General Chemistry I, II, III	6

**FOURTH YEAR**

03.351, 352, 353	Bioelectronic Devices I, II, III	6
03.357, 358, 359	Bioelectronic Lab. I, II, III	6
12.341, 342, 343	Physical Chemistry I, II, III	6
18.324, 325, 326	Anatomy and Physiology I, II, III	6

\*Student may elect 12. 314, 315, 316 General Chemistry with Laboratory.

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**CYTOTECHNOLOGY****Leading to the Degree of Bachelor of Science**

A program offered through the cooperating efforts of Lincoln College and University College and conducted in affiliation with the several hospitals which comprise the Boston School of Cytotechnology. The program leads to the Bachelor of Science Degree, which is awarded by University College, and certification of registration by the American Society of Clinical Pathologists.

Cytotechnology is a specialty in the broader field of medical technology. Cytotechnologists are employed in pathology laboratories, where they expertly examine slides of cells looking for minute abnormalities which are the early warning signs of cancer and related disease. Cytotechnology occupies a highly important place in clinical medicine requiring a technician with not only highly specialized laboratory training but also sound academic background.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
30.504, 505, 506	English I, II, III	6
12.314, 315, 316	General Chemistry and Lab.	9

**SECOND YEAR**

10.321, 322, 323	Calculus I, II, III or	6
39.511, 512, 513	Statistics I, II, III	
18.311, 312, 313	General Biology and Lab. I, II, III	12
39.501, 502, 503	Economic Principles and Problems I, II, III	6

**THIRD YEAR**

12.331, 332, 333	Organic Chemistry I, II, III	6
12.334, 335, 336	Organic Chemistry Lab. I, II, III	6
19.501, 502, 503	Psychology I, II, III	6
11.304, 305, 306	General Physics I, II, III	6

**FOURTH YEAR**

12.321, 322, 323	Analytical Chemistry I, II, III	6
12.324, 325, 326	Analytical Chemistry Lab. I, II, III	6
23.501, 502, 503	Western Civilization I, II, III	6
18.324, 325, 326	Anatomy and Physiology I, II, III	6

(curriculum continued on page 62)

**FIFTH YEAR**

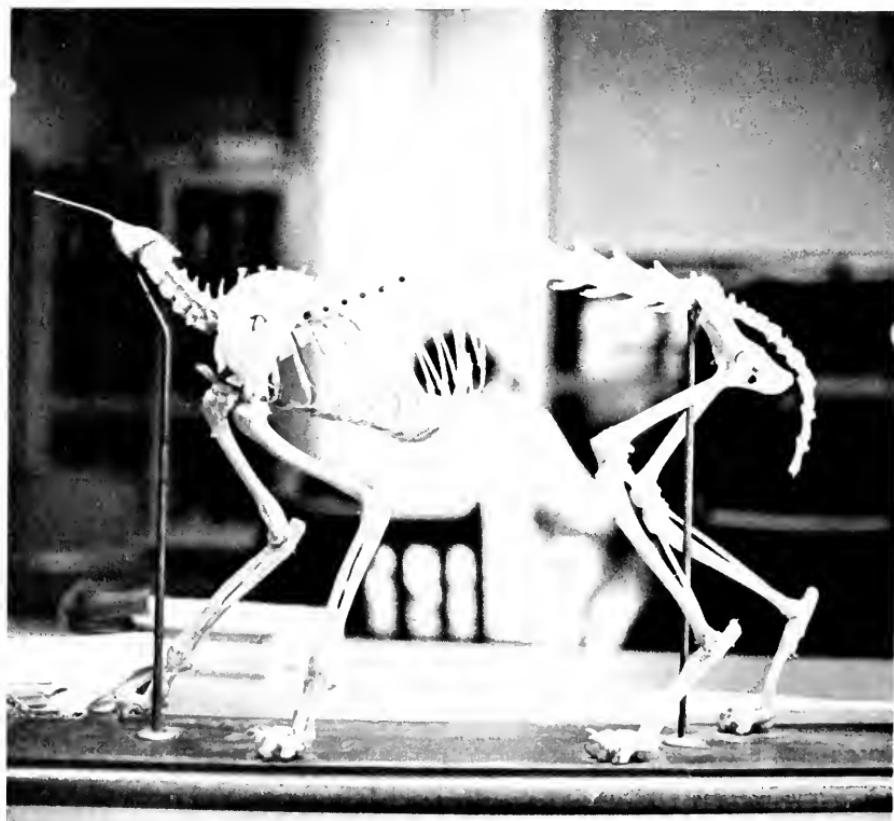
18.351, 352, 353	Histology-Organology I, II, III	6
86.501, 502	*Medical Terminology, Hospital Law and Ethics	4
18.391	*Photomicroscopy	2
6 Months	AMA-Approved Hospital School of Cytotechnology	{
6 Months	Internship	15†

**SIXTH YEAR**

18.321, 322, 323	Microbiology and Lab. I, II, III	12
18.341, 342, 343	Hematology I, II, III	6
00.000, 000, 000	Elective (Non-Science)	6

**SEVENTH YEAR**

17.311, 312, 313	Clinical Biochemistry I, II, III	6
30.507, 508, 509	Introduction to Literature I, II, III	6
00.000, 000, 000	Elective (Non-Science)	6
00.000, 000, 000	Elective	6



\*May be replaced by 86.504, 505, 506 Foundations of Medical Science I, II, III.

†Student will take Registry Examination at the end of hospital training period before academic credit for hospital school phase is officially granted.

**MEDICAL TECHNOLOGY****Leading to the Degree of Bachelor of Science**

The program in Medical Technology is a joint Lincoln College-University College program which is conducted in affiliation with several Hospital Schools of Medical Technology approved by the American Medical Association. The program leads to the Bachelor of Science Degree, which is awarded by University College, and entitles the student to take the registration examination of the American Society of Clinical Pathologists.

The medical technologist is a most respected and important member of the paramedical team. He works as a professional in close association with pathologists, doctors and hospital and medical laboratory personnel. Performing in a variety of specialized fields such as bacteriology, histology, biochemistry, and nuclear and radiochemistry, the medical technologist performs chemical tests, and morphologically and biochemically identifies bacteria. He makes important observations necessary for critical diagnosis by the doctor for early detection and treatment of diseases.

The Registered Medical Technologist is in constant demand in hospital laboratories, clinics, public health agencies, pharmaceutical firms, research foundations and in the Armed Forces.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
12.314, 315, 316	General Chemistry and Lab. I, II, III	9
30.504, 505, 506	English I, II, III	6

**SECOND YEAR**

10.321, 322, 323	Calculus I, II, III or	6
39.511, 512, 513	Statistics I, II, III	6
12.321, 322, 323	Analytical Chemistry I, II, III	6
12.324, 325, 326	Analytical Chemistry Lab. I, II, III	6
39.501, 502, 503	Economic Principles and Problems I, II, III	6

**THIRD YEAR**

12.331, 332, 333	Organic Chemistry I, II, III	6
12.334, 335, 336	Organic Chemistry Lab. I, II, III	6
18.311, 312, 313	General Biology and Lab. I, II, III	12

**FOURTH YEAR**

11.304, 305, 306	General Physics I, II, III	6
18.321, 322, 323	Microbiology and Lab. I, II, III	12
23.501, 502, 503	Western Civilization I, II, III	6

(curriculum continued on page 64)

**FIFTH YEAR**

12.351, 352, 353	Instrumental and Radiochemistry I, II, III	6
30.507, 508, 509	Introduction to Literature I, II, III	6
73.311, 312, 313	Clinical Biochemistry	6
00.000, 000, 000	*Elective I, II, III	6

**SIXTH YEAR**

12 months' internship at an A.M.A.-approved Hospital School of Medical Technology	30
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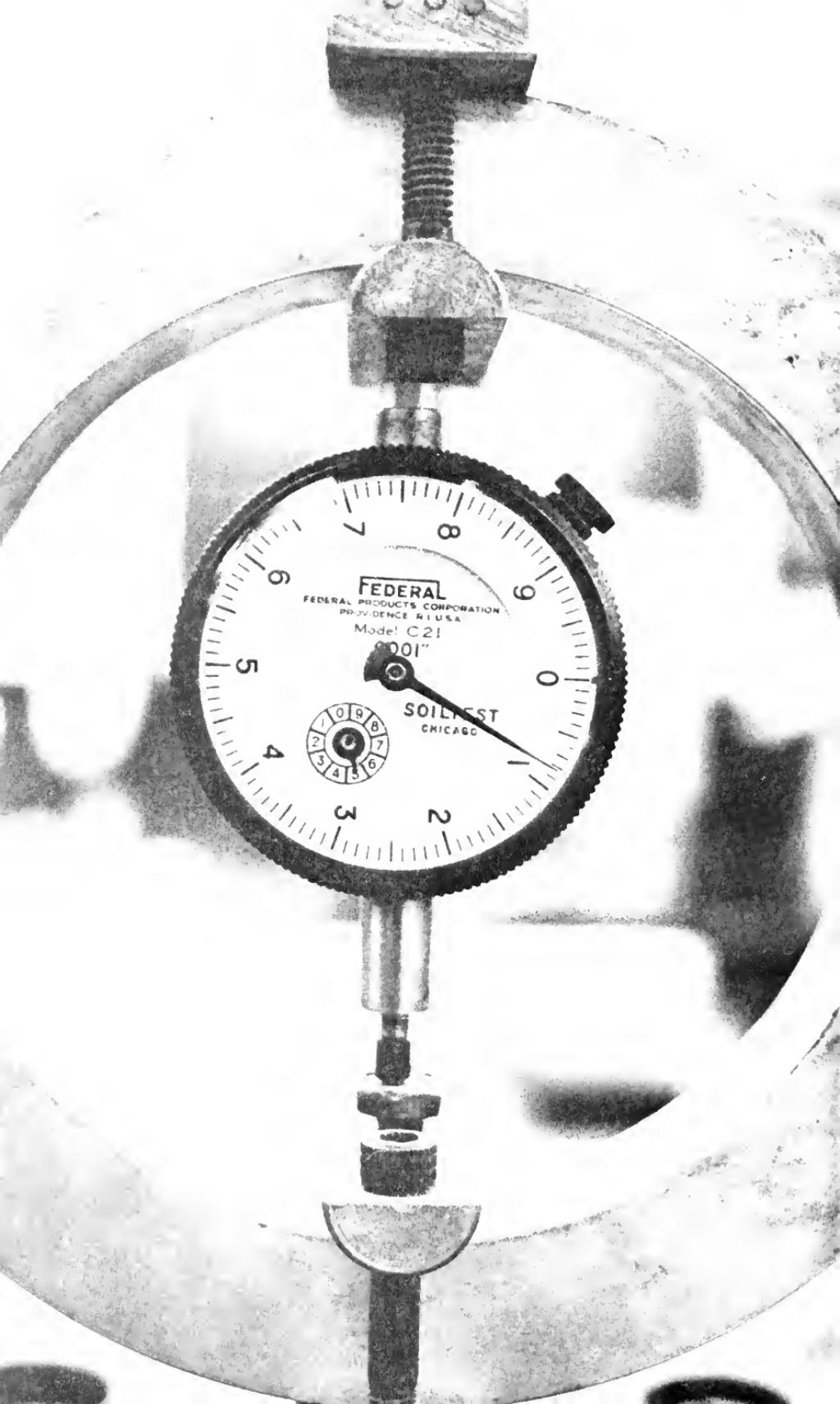
**SEVENTH YEAR**

18.341, 342, 343	Hematology I, II, III	6
19.501, 502, 503	Psychology I, II, III	6
00.000, 000, 000	*Elective (Non-Science) I, II, III	6
00.000, 000, 000	*Elective (Science) I, II, III	6



\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.





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## CIVIL ENGINEERING TECHNOLOGY PROGRAMS

Civil Engineering deals with the planning and construction of all kinds of relatively permanent structures and public works. Its major functions are: the preparation of surveys (topographical, geological, traffic, utility, etc.); the design of structures (buildings, bridges, dams, harbor facilities, etc.); the planning of municipal systems (water, sanitary, gas, flood control, etc.); and the development of transportation facilities (highway, railway, waterway, airway, etc.).

In performing these functions, the civil engineer will work in close association with professionals in the field, and he may develop technologically to function independently and in positions of managerial responsibility.

Employment opportunities for Civil Engineering Technology program graduates are with town, city, state or federal public works departments and agencies; private consulting, engineering, architectural and construction organizations; and with railroads and the military.

The Civil Engineering Technology related programs offered to the Lincoln College students are:

### **Associate in Engineering Degree**

Municipal and Sanitary Engineering Technology . . . . .	page 68
Structural Engineering Technology . . . . .	page 69
Surveying and Transportation Engineering Technology . . . . .	page 70

### **Bachelor of Engineering Technology Degree**

Civil Engineering Technology . . . . .	pages 71-72
Mechanical-Structural Engineering Technology . . . . .	pages 73-74

**MUNICIPAL AND SANITARY ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Municipal and Sanitary Engineering Technology prepares the graduate to assume responsibilities related to the design, construction, operation and supervision of municipal plants and systems concerned with the storage and distribution of water and also the disposal of sewage and waste in urban areas with due consideration for contamination and pollution. Employment opportunities are with town, city, and state public works departments, private engineering consultants, architects, contractors and many other engineering organizations.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

01.301, 302, 303	Surveying I, II, III	6
02.301, 302, 303	Mechanics (Statics) I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

01.341, 342, 343	Fluid Mechanics I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
01.341, 342, 343	Fluid Mechanics I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
12.311, 312, 313	*General Chemistry I, II, III	6

**FOURTH YEAR**

01.324, 325, 326	Structural Analysis I, II, III	6
01.351, 352, 353	Municipal and Sanitary Engineering I, II, III	6
01.361, 362, 363	Materials and Soil Mechanics I, II, III	6
01.371, 372, 373	Reinforced Concrete Design I, II, III	6

\*Students may elect to take 12.314, 315, 316 General Chemistry and Laboratory 1, 11, 111.

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**STRUCTURAL ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Structural Engineering Technology prepares the graduate to assume responsibilities related to the planning, design and supervision of the construction of buildings, bridges, foundations; flood-control projects and all fixed structures. Employment opportunities are with consulting engineering firms, architectural groups, contractors, railroads, government agencies, the military, and other design-related companies.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

01.301, 302, 303	Surveying I, II, III	6
02.301, 302, 303	Mathematics (Statics) I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

01.321, 322, 323	Intro. to Structures I, II, III	6
01.341, 342, 343	Fluid Mechanics I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6

**FOURTH YEAR**

01.324, 325, 326	Structural Analysis I, II, III	6
01.331, 332, 333	Design of Structures I, II, III	6
01.361, 362, 363	Materials and Soil Mechanics I, II, III	6
01.371, 372, 373	Reinforced Concrete Design I, II, III	6

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**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**SURVEYING AND TRANSPORTATION ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Surveying and Transportation Engineering Technology prepares the graduate to assume responsibilities related to the preparation and calculation of preliminary and legal surveys required for both small projects such as subdivision work, individual lot layouts, and highway layouts as well as more complex projects relating to sewer systems, pipelines, power transmission lines, dams, reservoirs and aqueducts. Employment opportunities are with independent surveying companies; civil engineering companies; highway, transit and railroad planning groups as well as cartographers, construction companies and contractors.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

01.301, 302, 303	Surveying I, II, III	6
02.301, 302, 303	Mathematics (Statics) I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

01.304, 305, 306	Advanced Surveying I, II, III	6
01.341, 342, 343	Fluid Mechanics I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6

**FOURTH YEAR**

01.307, 308, 309	Legal Aspects of Surveying I, II, III	6
01.311, 312, 313	Transportation Engineering I, II, III	6
01.361, 362, 363	Materials and Soil Mechanics I, II, III	6
01.371, 372, 373	Reinforced Concrete Design I, II, III	6

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**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**CIVIL ENGINEERING TECHNOLOGY****Leading to the Degree of Bachelor of Engineering Technology**

The program in Civil Engineering Technology prepares the graduate to assume broad responsibilities related to surveys required to develop initial design criteria and specifications, and to become involved in the planning, design and construction of all kinds of relatively permanent structures; municipal plants and systems or transportation systems and facilities. Employment opportunities are in private consulting firms, construction companies, and public works agencies. Work involving surveying, design and supervision is open to graduates.

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

01.301, 302, 303	Surveying I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6
30.504, 505, 506	English I, II, III	6

**THIRD YEAR**

01.304, 305, 306	Advanced Surveying I, II, III	6
02.301, 302, 303	Mechanics (Statics) I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**FOURTH YEAR**

01.307, 308, 309	Legal Aspects of Survey I, II, III	6
01.321, 322, 323	Intro. to Structures I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
23.501, 502, 503	Western Civilization I, II, III	6

\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

**FIFTH YEAR**

12.311, 312, 313	†General Chemistry I, II, III	6
01.324, 325, 326	Structural Analysis I, II, III	6
01.341, 342, 343	Fluid Mechanics I, II, III	6
39.501, 502, 503	Economic Prin. and Problems I, II, II	6

**SIXTH YEAR**

01.331, 332, 333	Design of Structures I, II, III	6
01.361, 362, 363	Materials and Soil Mechanics I, II, III	6
19.501, 502, 503	Psychology I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**SEVENTH YEAR**

01.371, 372, 373	Reinforced Concrete Design I, II, III	6
01.311, 312, 313	Transportation Engineering I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**EIGHTH YEAR**

01.351, 352, 353	Municipal and Sanitary Engineering I, II, III	6
30.507, 508, 509	Intro. to Literature I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

†Students may elect to take 12.314, 315, 316 Gen. Chem. and Laboratory I, II, III.

**MECHANICAL-STRUCTURAL ENGINEERING TECHNOLOGY****Leading to the Degree of Bachelor of Engineering Technology**

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it prepares the graduate to assume responsibilities related to both the planning and construction of relatively static structures such as buildings, bridges, docks, etc. and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content are integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil and mechanical professions and companies.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

09.314, 315, 316	Production Drawing and Design I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6
30.504, 505, 506	English I, II, III	6

**THIRD YEAR**

01.301, 302, 303	Surveying I, II, III	6
02.301, 302, 303	Mechanics (Statics) I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**FOURTH YEAR**

01.321, 322, 323	Intro. to Structures I, II, III	6
02.304, 305, 306	Mechanics (Dynamics) I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
23.501, 502, 503	Western Civilization I, II, III	6

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\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

**FIFTH YEAR**

01.324, 325, 326	Structural Analysis I, II, III	6
01.341, 342, 343	Fluid Mechanics I, II, III	6
01.361, 362, 363	Materials and Soil Mechanics I, II, III	6
39.501, 502, 503	Economic Prin. and Problems I, II, III	6

**SIXTH YEAR**

01.331, 332, 333	Design of Structures I, II, III	6
02.324, 325, 326	Adv. Stress Analysis I, II, III	6
19.501, 502, 503	Psychology I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**SEVENTH YEAR**

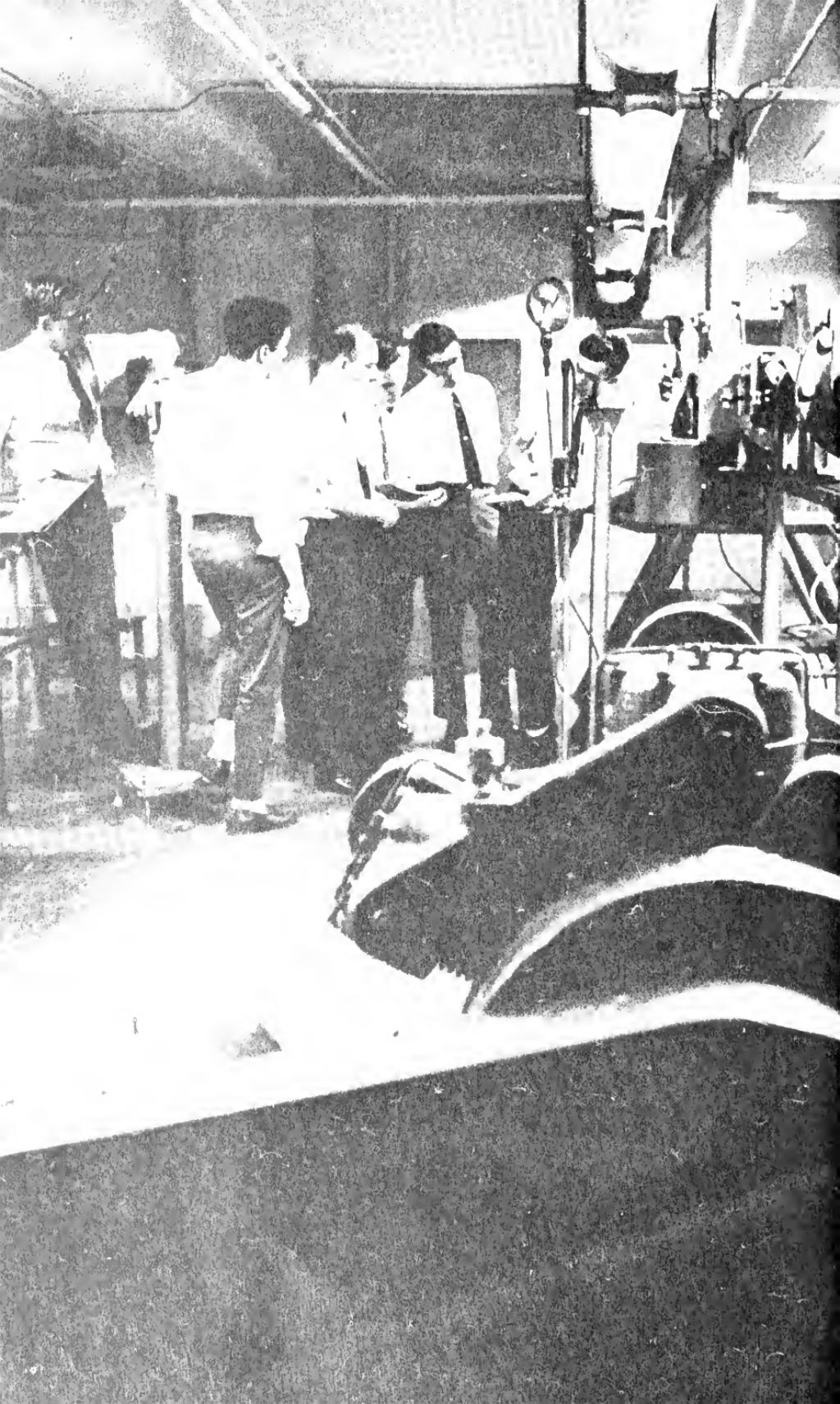
01.371, 372, 373	Reinforced Concrete Design I, II, III	6
02.327, 328, 329	Mechanical Design I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**EIGHTH YEAR**

02.331, 332, 333	Mechanical Technology Lab. I, II, III	6
30.507, 508, 509	Intro. to Literature I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.





## MECHANICAL ENGINEERING TECHNOLOGY PROGRAMS

Mechanical Engineering deals with the harnessing of power resources by means of machinery to perform useful work. In contrast to civil engineering which deals primarily with static forces and structures, mechanical engineering is more concerned with the motion and kinetics of devices which are activated by hydraulic, electrical, mechanical, or thermodynamic forces. Major functions of the mechanical engineer are: 1) design and installation of all kinds of machinery from pocket watches to the largest of steel boring mills; 2) development and production of engines and transportation equipment (automobile, aircraft, ship, railway, etc.); 3) construction and operation of furnaces, boilers as well as heating and air-conditioning equipment for the control of atmospheric and environmental conditions.

Employment opportunities for Mechanical Engineering Technology graduates are in the areas of 1) research, design or development; 2) production, operation, testing or control and 3) installation, maintenance and sales. In performing these functions, graduates will work in close association with professionals in the field and may develop technologically to function independently and in positions of managerial responsibility.

The Mechanical Engineering Technology program and related programs offered by Lincoln College are:

### Associate in Engineering Degree

Mechanical Engineering Technology . . . . .	page 78
Heat Engineering Technology . . . . .	page 79

### Bachelor of Engineering Technology Degree

Mechanical Engineering Technology . . . . .	pages 80-81
Mechanical-Structural Engineering Technology . . . . .	pages 82-83

**MECHANICAL ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Mechanical Engineering Technology prepares the graduate to assume responsibilities related to the design, production and installation of mechanical tools, machinery, engines and transportation equipment in which there is an intermingling of mechanical and hydraulic forces. Because of the increased mechanization of all industry, varied employment opportunities are available in private engineering consultant groups, and in light and heavy industries, as well as almost all engineering design organizations.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

02.301, 302, 303	Mechanics (Statics) I, II, III	6
09.314, 315, 316	Production Drawing and Design I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

02.304, 305, 306	Mechanics (Dynamics) I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
02.341, 342, 343	Materials I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6

**FOURTH YEAR**

01.341, 342, 343	Fluid Mechanics I, II, III	6
02.324, 325, 326	Adv. Stress Analysis I, II, III	6
02.327, 328, 329	Mechanical Design I, II, III	6
02.331, 332, 333	Mechanical Technology Lab. I, II, III	6

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**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**HEAT ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Heat Engineering Technology prepares the graduate to assume responsibilities related to the design, operation, and construction of engines and equipment in which there are thermodynamic, hydraulic and mechanical forces. Typical examples are automobile, aircraft, and ship engines; boilers and furnaces; as well as heating, air conditioning and ventilating devices. Employment opportunities are with architectural firms, engineering consultants, light and heavy mechanical industries, as well as other engineering oriented organizations.

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

02.301, 302, 303	Mechanics (Statics) I, II, III	6
09.314, 315, 316	Production Drawing and Design I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

02.304, 305, 306	Mechanics (Dynamics) I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
02.351, 352, 353	Thermodynamics I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6

**FOURTH YEAR**

01.341, 342, 343	Fluid Mechanics I, II, III	6
02.354, 355, 356	Heat Transfer I, II, III	6
02.357, 358, 359	Heat Engineering I, II, III	6
02.361, 362, 363	Heat Technology Lab. I, II, III	6

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**MECHANICAL ENGINEERING TECHNOLOGY****Leading to the Degree of Bachelor of Engineering Technology**

The program in Mechanical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, production, operation and installation of all kinds of machinery, engines, transportation equipment as well as boilers, furnaces, and heating or air conditioning equipment, which involve interactions of mechanical, hydraulic and thermodynamic forces. Employment opportunities are in industries producing mechanized and automated equipment, design and engineering organizations, and in companies dealing primarily with manufacture and production.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II,	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

09.314, 315, 316	Production Drawing and Design I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6
30.504, 505, 506	English I, II, III	6

**THIRD YEAR**

02.301, 302, 303	Mechanics (Statics) I, II, III	6
02.341, 342, 343	Materials I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**FOURTH YEAR**

01.341, 342, 343	Fluid Mechanics I, II, III	6
02.304, 305, 306	Mechanics (Dynamics) I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
23.501, 502, 503	Western Civilization I, II, III	6

\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

**FIFTH YEAR**

02.324, 325, 326	Adv. Stress Analysis I, II, III	6
02.351, 352, 353	Thermodynamics I, II, III	6
12.381, 382, 383	Nuclear Technology I, II, III	6
39.501, 502, 503	Economic Prin. and Problems I, II, III	6

**SIXTH YEAR**

02.327, 328, 329	Mechanical Design I, II, III	6
02.354, 355, 356	Heat Transfer I, II, III	6
19.501, 502, 503	Psychology I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**SEVENTH YEAR**

02.331, 332, 333	Mechanical Technology Lab. I, II, III	6
02.357, 358, 359	Heat Engineering I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**EIGHTH YEAR**

02.361, 362, 363	Heat Technology Lab. I, II, III	6
30.507, 508, 509	Introduction to Literature I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

**MECHANICAL-STRUCTURAL ENGINEERING TECHNOLOGY PROGRAM****Leading to the Degree of Bachelor of Engineering Technology**

The program in Mechanical-Structural Engineering Technology is interdisciplinary in that it prepares the graduate to assume responsibilities related to both the planning and construction of relatively static structures such as buildings, bridges, docks, etc., and also the design and production of dynamic machine tools, machinery, and other mechanical devices. The mechanical and structural content are integrated so as to be complementary and to provide a broad base for design problems of great variety. Employment opportunities lie in the architectural, construction, civil, and mechanical professions and companies.

*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II,	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

09.314, 315, 316	Production Drawing and Design I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6
30.504, 505, 506	English I, II, III	6

**THIRD YEAR**

01.301, 302, 303	Surveying I, II, III	6
02.301, 302, 303	Mechanics (Statics) I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**FOURTH YEAR**

01.321, 322, 323	Introduction to Structures I, II, III	6
02.304, 305, 306	Mechanics (Dynamics) I, II, III	6
02.321, 322, 323	Stress Analysis I, II, III	6
23.501, 502, 503	Western Civilization I, II, III	6

<sup>a</sup>Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.

**FIFTH YEAR**

01.324, 325, 326	Structural Analysis I, II, III	6
01.341, 342, 343	Fluid Mechanics I, II, III	6
02.341, 342, 343	Materials I, II, III	6
39.501, 502, 503	Economic Prin. and Problems I, II, III	6

**SIXTH YEAR**

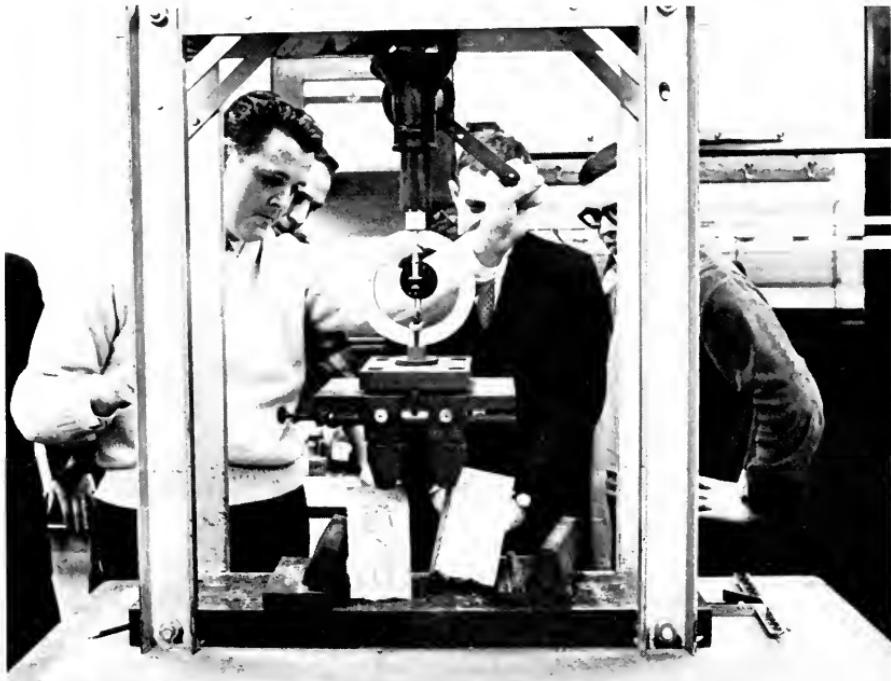
01.331, 332, 333	Design of Structures I, II, III	6
02.324, 325, 326	Advanced Stress Analysis I, II, III	6
19.501, 502, 503	Psychology I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**SEVENTH YEAR**

01.371, 372, 373	Reinforced Concrete Design I, II, III	6
02.327, 328, 329	Mechanical Design I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**EIGHTH YEAR**

02.331, 332, 333	Mechanical Technology Lab. I, II, III	6
30.507, 508, 509	Introduction to Literature I, II, III	6
00.000, 000, 000	*Elective I, II, III	6



\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.



## ELECTRICAL ENGINEERING TECHNOLOGY PROGRAMS

Electrical Engineering deals with the design and operation of equipment and systems related to distribution, communications, data-processing and electrical control. Its major functions are: 1) the generation, transmission and distribution of electrical energy for light and power purposes; 2) the development and production of equipment for telephone, radio, television, radar and communication; 3) the design and construction of data-processing systems and analog or digital computers; and 4) the application of electrical and electronic devices in the control of processes and manufacture.

Employment opportunities for the Electrical Engineering Technology graduate are in public and private research laboratories, in engineering consulting groups dealing with industrial and plant applications, design organizations dealing with operation and manufacture, and in sales engineering.

The Electrical Engineering Technology program and related programs offered by Lincoln College are:

### Associate in Engineering Degree

Bioelectronic Engineering Technology . . . . .	page 86
Electrical Power Engineering Technology . . . . .	page 87
Electronics Engineering Technology . . . . .	page 88

### Post-Associate Degree Certificate

Control Systems Engineering Technology . . . . .	page 89
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### Bachelor of Engineering Technology Degree

Electrical Engineering Technology . . . . .	pages 90-91
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**BIOELECTRONIC ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Bioelectronic Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, and operation of modern medical electronic devices used in the measurement, recording and analysis of anatomical, physiological, and biochemical functions in humans and animals. The curriculum builds heavily on electronics theory, chemistry and human physiology with emphasis on typical bioelectronic devices and their laboratory applications. Employment opportunities are in biological, chemical, physiological and pharmaceutical research laboratories; in clinics and hospital in relation to medical diagnoses and patient care; as well as in industrial organizations concerned with the design, development and production of the equipment.

**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

03.301, 302, 303	Circuit Theory I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

03.304, 306, 323	Circuit Theory IV, Electrical Measurements and Electronic Lab.	6
03.311, 312, 313	Electronics I, II, III	12
12.311, 312, 313	*General Chemistry I, II, III	6

**FOURTH YEAR**

03.351, 352, 353	Bioelectronic Devices I, II, III	6
03.357, 358, 359	Bioelectronic Lab. I, II, III	6
12.341, 342, 343	Physical Chemistry I, II, III	6
18.324, 325, 326	Anatomy and Physiology I, II, III	6

\*Student may elect 12.314, 315, 316 General Chemistry and Laboratory.

**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**ELECTRICAL POWER ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Electrical Power Engineering Technology prepares the graduate to assume responsibilities related to the design, installation, operation and maintenance of electrical machinery, power and control apparatus, and larger equipment employing heavy currents. The curriculum includes the generation, transmission and distribution of electrical energy for light and power, and the application and operation of electrical machinery in industry.

Employment opportunities are in power companies, public utilities, electrical manufacturing companies, consulting engineering firms, control equipment design organizations, and communications companies.

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**Prerequisite:** Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

03.301, 302, 303	Circuit Theory I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

03.304, 305, 306	Circuit Theory IV, V, Electrical Measurements	6
03.311, 312, 313	Electronics I, II, III	12
03.331, 332, 333	Energy Conversion I, II, III	6

**FOURTH YEAR**

03.334, 335, 336	Control Circuits I, II, III	6
03.337, 338, 339	Basic Power Systems I, II, III	12
03.341, 342, 343	Power and Controls Lab. I, II, III	6

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**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**ELECTRONICS ENGINEERING TECHNOLOGY****Leading to the Degree of Associate in Engineering**

The program in Electronic Engineering Technology prepares the graduate to assume responsibilities related to the design, development, and operation of communications, data-processing and electronic control equipment for applications in computers, military and space explorations and in automated industrial production equipment. Employment opportunities are in communications equipment, electrical manufacturing, data-processing and control equipment organizations, as well as other engineering oriented companies.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

03.301, 302, 303	Circuit Theory I, II, III	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6

**THIRD YEAR**

03.304, 306, 323	Circuit Theory IV, Electrical Measurements, Electronic Lab.	6
03.311, 312, 313	Electronics I, II, III	12
11.321, 322, 323	Particles and Waves I, II, III	6

**FOURTH YEAR**

03.314, 315, 316	Pulse Circuits I, II, III	6
03.317, 318, 319	Communications Engineering I, II, III	12
03.327, 328, 329	Advanced Electronic Lab. I, II, III	6

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**Note:** Associate degree graduates may transfer applicable credits toward the requirements in other Lincoln College programs leading to the Associate in Engineering, Associate in Science, or Bachelor of Engineering Technology degrees.

**CONTROL SYSTEMS ENGINEERING TECHNOLOGY****Leading to a Certificate**

The program in Control Systems Engineering Technology is designed to provide electrical and electronic background required in the development of control equipment and systems related to the age of automation. Practicing engineers who wish to avoid technological obsolescence may keep abreast of current control practices. The program presumes graduation from either Associate in Engineering degree programs in Electrical or Electronic Engineering Technology or Bachelor degree programs in a branch of engineering. A certificate will be awarded upon completion of 24 quarter hours of credit.

**REQUIRED COURSES**

Course Number	Course	Q.H.
03.361, 362, 363	Transients in Linear Systems I, II, III	6

**BASIC COURSES**

(May be taken concurrently with Transients in Linear Systems)

10.324, 325, 326	Differential Equations I, II, III	6
03.364, 365, 366	Advanced Circuit Theory I, II, III	6

**ELECTIVE COURSES**

(Require completion of Transients in Linear Systems)

03.367, 368, 369	Pulse and Digital Circuits I, II, III	6
03.381, 382, 383	Transistor Circuit Engineering I, II, III	6
03.371, 372, 373	Analog and Digital Computers I, II, III	6
03.374, 375, 376	Digital Systems I, II, III	6
03.377, 378, 379	Control Systems I, II, III	6

**ELECTRICAL ENGINEERING TECHNOLOGY****Leading to the Degree of Bachelor of Engineering Technology**

The program in Electrical Engineering Technology prepares the graduate to assume broad responsibilities related to the design, development, operation, installation and production of a wide variety of electrical and electronic equipment concerned with the generation and utilization of electric energy, communications, data-processing, and industrial control. Employment opportunities are in public and private research laboratories, engineering consulting firms dealing with industrial and plant applications, design organizations concerned with operation and manufacture as well as installation and sales.

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*Prerequisite:* Satisfactory completion of the Mathematics Placement Test or the Introductory Mathematics I and II courses (10.301 and 10.302).

**FIRST YEAR**

Course Number	Course	Q.H.
09.311, 312, 313	Engineering Graphics I, II, III	6
10.311, 312	Algebra I, II	4
10.313, 314	Trigonometry I, II	4
10.315	Intro. to Calculus	4
11.311, 312, 313	Physics I, II, III	6

**SECOND YEAR**

03.301, 302, 303	Circuit Theory I, II, III	6
10.321, 322, 323	Calculus I, II, III	6
11.314, 315, 316	Physics IV, V, VI	6
30.504, 505, 506	English I, II, III	6

**THIRD YEAR**

03.304, 305, 306	Circuit Theory IV, V, and Electrical Measurements	6
09.351, 352, 353	Prin. of Computer Programming I, II, III	6
10.324, 325, 326	Differential Equations I, II, III	6
11.321, 322, 323	Particles and Waves I, II, III	6

**FOURTH YEAR**

03.311, 312, 313	Electronics I, II, III	12
03.331, 332, 333	Energy Conversion I, II, III	6
03.324, 325	Circuits Laboratory I, II	4

**FIFTH YEAR**

03.317, 318, 319	Communication Engineering I, II, III	12
23.501, 502, 503	Western Civilization I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**SIXTH YEAR**

03.327, 328, 329	Advanced Electronic Lab. I, II, III	6
03.361, 362, 363	Transients in Linear Systems I, II, III	6
39.501, 502, 503	Economic Principles and Prob. I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**SEVENTH YEAR**

03.371, 372, 373	Analog and Digital Computers I, II, III	6
19.501, 502, 503	Psychology I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

**EIGHTH YEAR**

03.377, 378, 379	Control Systems I, II, III	6
30.507, 508, 509	Intro. to Literature I, II, III	6
00.000, 000, 000	*Elective I, II, III	6

\*Before registering for any electives, students should submit a proposed program of elective courses—preferably representing a minor field of concentration consistent with his personal career objectives—for approval by the Committee on Education.



## INDUSTRIAL TECHNOLOGY PROGRAM

Industrial Technology is concerned with the application of scientific methods to problems in the field of production management involving the effective use of men, materials, machinery, and money.

Industrial Technology programs are intended to meet the demand for men and women trained to assume administrative responsibility in a technical industry. Although based upon engineering or science technology, the curriculum contains business, social science, and liberal content courses and is designed to prepare for positions of administrative or supervisory, rather than highly specialized technological responsibility.

Upon graduation, the industrial technologist may find his way into such factory staff departments as methods engineering, production planning and control, wage administration, quality control, and time study. Additional opportunities are in cost accounting, statistical analysis, sales engineering, and safety engineering.

Students interested in pursuing a program closely related to the more traditional Industrial Engineering Technology should complete the Associate in Engineering degree program in Mechanical Engineering Technology, after which they should continue in the Industrial Technology program.

In conjunction with University College, Lincoln College offers the following program:

### Bachelor of Science Degree

Industrial Technology . . . . . page 94

**INDUSTRIAL TECHNOLOGY****Leading to the Degree of Bachelor of Science**

The Industrial Technology curriculum combines fundamental courses in one of several areas of engineering or science technology with an integrated program in management, the humanities, and the social sciences to provide background for those who aspire to positions of managerial responsibility where technical knowledge is required.

The curriculum is offered by University College in conjunction with Lincoln College. Graduates of Lincoln College or other technical schools who have been awarded the Associate degree may be granted up to ninety-six hours credit toward the Bachelor of Science degree. The technology requirements may also be earned by satisfactory completion of equivalent technology courses in an accredited engineering college or technical institute.

The total requirements for the degree are 174 quarter hours distributed as follows:

	Q.H.
Engineering or Science Technology Courses	96
Liberal Content—Required	36
39.501, 502, 503 Economic Principles and Problems I, II, III	6
21.501, 502, 503 Sociology I, II, III	6
30.504, 505, 506 English I, II, III	6
30.507, 508, 509 Introduction to Literature I, II, III	6
19.501, 502, 503 Psychology I, II, III	6
23.501, 502, 503 Western Civilization I, II, III	6
Management Courses—Required	34
45.501, 502, 503 Management and Organization I, II, III	6
45.570, 571, 572 Electronic Data-Processing I, II, III	6
45.541, 542, 543 Law I, II, III	6
41.501, 502, 503 Accounting Principles I, II, III	6
45.510 Labor-Management Relations	2
39.510 Statistics for Quality Control	2
45.563 Management of Quality Control	2
45.561, 562 Statistical Quality Control I, II	4
Electives	8
Total Hours Required for Degree	<hr/> 174



# **Description of Courses**

On the pages which follow is a numerical and descriptive listing of courses offered in the several curricula of Lincoln College. Although not all courses are offered every year, all will be offered during the normal period of each student's curriculum. The term "prerequisite" indicates a course that must be taken before undertaking the advanced course to which it applies.

A "quarter hour" equals approximately three clock hours of work (ordinarily, one hour of class and two hours of preparation a week for a quarter of twelve weeks' duration). Laboratory and drawing courses normally require fewer hours of outside preparation and therefore carry less credit than lecture courses.

## **Abbreviations**

Prereq.—Prerequisite

Lab.—Laboratory hours

Cl.—Class hours

Q.H.—Quarter hours

## **Policy on Changes of Program**

Lincoln College reserves the right to withdraw, modify, or add to the courses offered or to change the order or content of courses in any curriculum.

The University further reserves the right to change the requirements for graduation, tuition, and fees charged, and other regulations. However, no change in tuition and fees at any time shall become effective until the school year following that in which it is announced.

Any changes which may be made from time to time relative to the above policy shall be applicable to all students in the school, college, or department concerned, including former students who may re-enroll.

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## **Civil Engineering Technology**

**01.301 Surveying I** Prereq. 10.314 2 Cl., 2 Q.H.  
Basic surveying principles; theory of measurements; basic traverse computations.

**01.302 Surveying II** Prereq. 01.301 2 Cl., 2 Q.H.  
Stadia principles and topography; simple, compound and vertical curves.

**01.303 Surveying III** Prereq. 01.302 2 Cl., 2 Q.H.  
Spiral easement curves, earthwork computations and the solution of the Mass Diagram.

**01.304 Advanced Surveying I** Prereq. 01.303  
1 Cl., 2 Lab., 2 Q.H.  
Introduction to observations for latitude, time azimuth including basic spherical trigonometry.

**01.305 Advanced Surveying II** Prereq. 01.304  
1 Cl., 2 Lab., 2 Q.H.  
Precise leveling, triangulation and base line measurements. Use of the Geodimeter and Telurometer.

**01.306 Advanced Surveying III** Prereq. 01.305  
1 Cl., 2 Lab., 2 Q.H.  
Basic principles of photogrammetry and map making from aerial photographs. Map projections.

**01.307 Legal Aspects of Surveying I** Prereq. 01.303  
2 Cl., 2 Q.H.  
Surveyor as an expert witness with emphasis on his knowledge of measurements; easements. Registry of Deeds procedure and how land is sold.

**01.308 Legal Aspects of Surveying II** Prereq. 01.307  
2 Cl., 2 Q.H.  
Deeds and their essential elements, descriptions and water rights.

**01.309 Legal Aspects of Surveying III** Prereq. 01.308  
2 Cl., 2 Q.H.  
Land court procedure and the subdivision control law.

**01.311 Transportation Engineering I** Prereq. 01.303  
2 Cl., 2 Q.H.  
Engineering considerations in the planning and construction of modern highways and highway routing.

<b>01.312 Transportation Engineering II</b>	Prereq. 01.311 2 Cl., 2 Q.H.
Rates of grade, superelevation, flexible and rigid pavements and other features of highway design.	
<b>01.313 Transportation Engineering III</b>	Prereq. 01.312 2 Cl., 2 Q.H.
Traffic flow and traffic control. Computer applications to transportation problems.	
<b>01.321 Introduction to Structures</b>	Prereq. 09.313 & 02.303 1 Cl., 2 Lab., 2 Q.H.
Framing plans and details for steel structures.	
<b>01.322 Introduction to Structures II</b>	Prereq. 01.321 1 Cl., 2 Lab., 2 Q.H.
Structural shop drafting and the evaluation of load capacities of rivets, welds and bolts for structural connections using the AISC code.	
<b>01.323 Introduction to Structures III</b>	Prereq. 01.322 1 Cl., 2 Lab., 2 Q.H.
Design and detailing of joints including standard connections, seats and brackets.	
<b>01.324 Structural Analysis I</b>	Prereq. 02.323 2 Cl., 2 Q.H.
Reactions, shears, bending moments and forces developed by loads on beams and trusses. Analytical and graphical methods.	
<b>01.325 Structural Analysis II</b>	Prereq. 01.324 2 Cl., 2 Q.H.
Influence lines for beams, girders and trusses. Solutions for forces from moving load systems on statically determinate structures.	
<b>01.326 Structural Analysis III</b>	Prereq. 01.325 2 Cl., 2 Q.H.
Introduction to classical methods for deflection solutions of beams and trusses. Methods of solving statically indeterminate structures.	
<b>01.331 Design of Structures I</b>	Prereq. 01.323 & 02.323 2 Cl., 2 Q.H.
Design of steel members in structural frames. Tension, compression, bending and eccentrically loaded members.	
<b>01.332 Design of Structures II</b>	Prereq. 01.331 2 Cl., 2 Q.H.
Design of plate girders, highway bridge decks, and roof framing systems.	
<b>01.333 Design of Structures III</b>	Prereq. 01.332 2 Cl., 2 Q.H.
Composite design in bridges and buildings. Introduction to plastic design methods in steel.	

## **100 / COURSES**

<b>01.341 Fluid Mechanics I</b>	Prereq. 02.303 2 Cl., 2 Q.H.
Hydrostatics; pressure on submerged areas, simple dams, manometers fluid flow and flow meters.	
<b>01.342 Fluid Mechanics II</b>	Prereq. 01.341 2 Cl., 2 Q.H.
Pipe friction, equivalent pipes and pipe networks. Dimensional analysis.	
<b>01.343 Fluid Mechanics III</b>	Prereq. 01.342 2 Cl., 2 Q.H.
Open-channel flow, weirs, Reynold's numbers and viscosity.	
<b>01.351 Municipal and Sanitary Engineering I</b>	Prereq. 01.343 & 12.313 2 Cl., 2 Q.H.
Principles of water supply engineering; population forecasting, quality and quantity of water for various uses. Water-treatment processes.	
<b>01.352 Municipal and Sanitary Engineering II</b>	Prereq. 01.351 2 Cl., 2 Q.H.
Collection and disposal of sewage and storm water. Modern methods of treatment and sewage-plant operation.	
<b>01.353 Municipal and Sanitary Engineering III</b>	Prereq. 01.352 1 Cl., 2 Lab., 2 Q.H.
Layout and design of water-treatment and sewage treatment plants. Instrumentation; mechanical and electrical equipment.	
<b>01.361 Materials and Soil Mechanics I</b>	Prereq. 02.303 2 Cl., 2 Q.H.
Physical properties of bituminous and Portland cement materials of construction. Lectures supplemented with some laboratory exposure.	
<b>01.362 Materials and Soil Mechanics II</b>	Prereq. 01.361 2 Cl., 2 Q.H.
Soil classification, identification, properties, and the phase relationships.	
<b>01.363 Materials and Soil Mechanics III</b>	Prereq. 01.362 2 Cl., 2 Q.H.
Shear strength and consolidation theory. Applications of soil properties in determining lateral and bearing pressures.	
<b>01.371 Reinforced-Concrete Design I</b>	Prereq. 02.323 2 Cl., 2 Q.H.
Design of bending members in reinforced concrete, using elastic and ultimate-strength theories.	
<b>01.372 Reinforced-Concrete Design II</b>	Prereq. 01.371 2 Cl., 2 Q.H.
Design of axially and eccentrically loaded columns by elastic and ultimate strength principles.	

**01.373 Reinforced-Concrete Design III**Prereq. 01.372  
2 Cl., 2 Q.H.

Reinforced-concrete design of basic structures including consideration of continuity.

## Mechanical Engineering Technology

**02.301 Mechanics (Statics) I**

Prereq. 10.315 2 Cl., 2 Q.H.

Forces, moments, couples, statics of particles and rigid bodies in two and three dimensions.

**02.302 Mechanics (Statics) II**

Prereq. 02.301 2 Cl., 2 Q.H.

Distributed forces—external and internal. First moments and centroids. Analysis of structures—trusses, frames and machines.

**02.303 Mechanics (Statics) III**

Prereq. 02.302 2 Cl., 2 Q.H.

Friction, second moments and virtual work.

**02.304 Mechanics (Dynamics) I**

Prereq. 02.303 2 Cl., 2 Q.H.

Kinematics of particles—rectilinear and curvilinear motion of dynamic particles—force, mass and acceleration, work and energy.

**02.305 Mechanics (Dynamics) II**

Prereq. 02.304 2 Cl., 2 Q.H.

Kinematics and dynamics of rigid bodies—force mass and acceleration.

**02.306 Mechanics (Dynamics) III**

Prereq. 02.305 2 Cl., 2 Q.H.

Dynamics of rigid bodies—work and energy, impulse and momentum. Introduction to mechanical vibration.

**02.321 Stress Analysis I**

Prereq. 02.303 2 Cl., 2 Q.H.

Stress and deformation; mechanical properties of materials; allowable stresses and factor of safety; axially loaded indeterminate members; effects of temperature on stresses and strains; thin cylinders and spheres.

**02.322 Stress Analysis II**

Prereq. 02.321 2 Cl., 2 Q.H.

Shear and bending moment in beams; stresses in beams; design of beams; curvature of beams.

**02.323 Stress Analysis III**

Prereq. 02.322 2 Cl., 2 Q.H.

Determinate and indeterminate beam deflections and reactions by integration and moment—area methods; theorem of three moments.

**02.324 Advanced Stress Analysis I**

Prereq. 02.323 2 Cl., 2 Q.H.

Energy absorption and resilience; deflections of determinate and indeterminate beams by moment distribution and energy methods; torsional stresses and strains; power transmissions; dynamic loading.

**02.325 Advanced Stress Analysis II** Prereq. 02.324 2 Cl., 2 Q.H.  
Combined loading; principle stresses; Mohr's circle for stresses and strains  
in two and three dimensions; modes of failure; theories of failure.

**02.326 Advanced Stress Analysis III** Prereq. 02.325 2 Cl., 2 Q.H.  
Curved beams; shear center of beams; thick cylinders; columns; riveted  
and welded joints.

**02.327 Mechanical Design I** Prereq. 02.306, 02.326 2 Cl., 2 Q.H.  
Materials, properties and selection of materials; stress concentrations;  
screws, fasteners and joints; press, shrink and friction joints; cylinder  
heads and cover plates, keys and pins.

**02.328 Mechanical Design II** Prereq. 02.327 2 Cl., 2 Q.H.  
Torsion of non-circular cross-sections; springs; stresses and deformation;  
unsymmetrical bending of beams; fatigue; fluctuating stresses for ductile  
and brittle materials; stresses and power transmission of spur gears.

**02.329 Mechanical Design III** Prereq. 02.328 2 Cl., 2 Q.H.  
Stresses and power transmission of helical, bevel, and worm gears;  
lubrication and journal bearings; antifriction bearings; shafts; clutches  
and brakes.

**02.331 Mechanical Technology Laboratory I** Prereq. 02.323 &  
02.343 3 Lab., 2 Q.H.  
Tests on instrumentation and measurement of standard characteristics  
of force, length, area, speed and power. Simple testing of materials.

**02.332 Mechanical Technology Laboratory II** Prereq. 02.331 &  
02.325 or Concurrently  
3 Lab., 2 Q.H.  
Flow of compressible and incompressible fluids. Advanced testing of  
structural materials.

**02.333 Mechanical Technology Laboratory III** Prereq. 02.332 &  
02.326 or Concurrently  
3 Lab., 2 Q.H.  
Aerodynamic and vibration testing. Experimental stress analysis projects.

**02.341 Materials I** 2 Cl., 2 Q.H.  
Lectures and demonstrations on: testing and failure of metals, alloying and  
hardening metals; extraction of metals from their ores; organic and in-  
organic materials, concrete, plastics, rubber, wood.

**02.342 Materials II** Prereq. 02.341 2 Cl., 2 Q.H.  
General metallurgical information covering theoretical aspects of prop-  
erties, of metals as well as processing of the metals. Structure, mechan-  
ical properties, equilibrium diagrams, hardening and heat treatment.

**02.343 Materials III** Prereq. 02.342 2 Cl., 2 Q.H.  
Theoretical and practical applications of secondary metal fabrication; including welding, powder metallurgy. Cutting-tool principles, gauging and measurements.

**02.351 Thermodynamics I** Prereq. 11.316 2 Cl., 2 Q.H.  
General theory of heat and matter; laws of thermodynamics; energy-transformation principles and availability of energy; properties and processes for pure substances and ideal gases.

**02.352 Thermodynamics II** Prereq. 02.351 2 Cl., 2 Q.H.  
Thermodynamic properties and processes of liquids and vapors; tables and charts; mixtures of fluids; theory of gas and vapor flow through orifices and nozzles.

**02.353 Thermodynamics III** Prereq. 02.352 2 Cl., 2 Q.H.  
Vapor and gas cycle analysis; fuels and combustion in steam boilers; theory of vapor engines and analysis of types of actual engines used compression of gases and vapors; internal combustion engines.

**02.354 Heat Transfer I** Prereq. 02.353 2 Cl., 2 Q.H.  
An introduction to the modes of heat transfer and fundamental laws of conduction; steady-state conduction in composite sections.

**02.355 Heat Transfer II** Prereq. 02.354 2 Cl., 2 Q.H.  
Natural and forced convection; electrical and thermal analogies. Kirchhoff's law of radiation heat transfer between simple bodies.

**02.356 Heat Transfer III** Prereq. 02.355 2 Cl., 2 Q.H.  
Combined conduction and convection heat transfer; mean temperature differences and overall heat transfer coefficients. Applications to engineering programs.

**02.357 Heat Engineering I (Refrigeration)** Prereq. 02.353  
2 Cl., 2 Q.H.  
Principles of gas compression, analysis of vapor compression, refrigeration systems, low temperature refrigeration cycles and absorption refrigeration systems.

**02.358 Heat Engineering II (Air Conditioning)** Prereq. 02.353  
2 Cl., 2 Q.H.  
Air conditioning principles including psychrometrics and heat pumps. Calculation of heating and cooling loads in accordance with A.S.H.R.A.E. practices.

**02.359 Heat Engineering III (Turbines)** Prereq. 02.353  
2 Cl., 2 Q.H.  
Design and performance of steam and gas turbines; spark-ignition and compression-ignition engines; overall power-plant design and performance.

<b>02.361 Heat Technology Laboratory I</b>	Prereq. 02.353 3 Lab., 2 Q.H.
Experiments concerning instrumentation and measurement of steam, air and liquid flow and temperature.	
<b>02.362 Heat Technology Laboratory II</b>	Prereq. 02.361, 02.354 & 02.357 3 Lab., 2 Q.H.
Performance and operation of heat power devices such as spark-ignition and compression-ignition engines. Simple heat transfer refrigeration and air conditioning experiments.	
<b>02.363 Heat Technology Laboratory III</b>	Prereq. 02.362; 02.356 or concurrently & 02.359 or concurrently 3 Lab., 2 Q.H.
Tests illustrating the application of heat power fundamentals to gas and steam turbines, condensers, combustion, and power plants.	

## **Electrical Engineering Technology**

<b>03.301 Circuit Theory I</b>	Prereq. 10.315 & 11.313 2 Cl., 2 Q.H.
Ohm's law, Kirchhoff's current and voltage laws, equivalent resistances and sources, Mesh and Nodal analysis, network theorems, two-port networks and power relations all with respect to direct currents.	
<b>03.302 Circuit Theory II</b>	Prereq. 03.301 2 Cl., 2 Q.H.
Energy storage, mutual inductance, singularity functions, response of R, L and C elements to singularities, response of R-L and R-C circuits to singularities.	
<b>03.303 Circuit Theory III</b>	Prereq. 03.302 2 Cl., 2 Q.H.
Complex algebra, phasors, frequency domain, transformers, steady-state a-c theory, driving-point and transfer impedances, power and energy in a-c circuits.	
<b>03.304 Circuit Theory IV</b>	Prereq. 03.303 2 Cl., 2 Q.H.
RLC networks and their responses to excitations. Fourier series, numerical methods, Laplace transforms; Laplace transform techniques applied to circuit theory.	
<b>03.305 Circuit Theory V</b>	Prereq. 03.304 2 Cl., 2 Q.H.
Consideration of balanced and unbalanced polyphase power circuits; symmetrical components, harmonic analysis.	
<b>03.306 Electrical Measurements</b>	Prereq. 03.304 2 Cl., 2 Q.H.
Measurement of voltage, current, power, resistance, capacitance, inductance, impedance, frequency tube characteristics, etc. Direct and	

substitution measurements. Evaluation of measured data—standard deviation and tolerance limits, instrument calibrations—effect of residual impedance.

**03.311 Electronics I** Prereq. 03.303 4 Cl., 4 Q.H.  
Semiconductor, vacuum, and gas diodes. Power supplies and filters. Transistors and tubes as amplifying devices. Graphical analysis of basic amplifiers. D.C. and A.C. load lines, the decibel.

**03.312 Electronics II** Prereq. 03.311 4 Cl., 4 Q.H.  
Transistor circuit analysis and design, including static characteristics, dc bias techniques, ac equivalent circuits and low-frequency amplifiers.

**03.313 Electronics III** Prereq. 03.312 4 Cl., 4 Q.H.  
Continuation of transistor circuits, including low-frequency amplifiers, frequency effects in audio amplifiers and low-frequency large-signal amplifiers.

**03.314 Pulse Circuits I** Prereq. 03.313 2 Cl., 2 Q.H.  
Review of fundamental concepts of transients. Wave-shaping circuitry.

**03.315 Pulse Circuits II** Prereq. 03.314 2 Cl., 2 Q.H.  
Multivibrators and pulse generators. Sweep generators and trigger circuits.

**03.316 Pulse Circuits III** Prereq. 03.315 2 Cl., 2 Q.H.  
Switching and counting, numbers and codes, logic fundamentals.

**03.317 Communication Engineering I** Prereq. 03.313  
4 Cl., 4 Q.H.  
Video amplifiers, direct-coupled amplifiers, and feedback in amplifiers.

**03.318 Communication Engineering II** Prereq. 03.317  
4 Cl., 4 Q.H.  
Turned voltage and power amplifiers. Oscillators.

**03.319 Communication Engineering III** Prereq. 03.318  
4 Cl., 4 Q.H.  
Amplitude modulation. Detectors and mixers. Frequency modulation.

**03.323 Electronic Laboratory** Prereq. 03.312 3 Lab., 2 Q.H.  
Experiments dealing with laboratory equipment techniques, transistor and crystal-diode characteristics, the impedance bridge, the Q-Meter, coils with iron cores, filter circuits, vacuum and gas diodes, power supplies including the regulated type, triode vacuum tubes, thyratrons, silicon controlled rectifiers, resistance-coupled amplifiers using tubes and transistors.

**03.324 Circuits Laboratory I** Prereq. 03.304 & 03.306 or concurrently 3 Lab., 2 Q.H.  
Experimentation in electric circuit theory. Instrumentation; verification of circuit theorems; linear and non-linear devices.

**03.325 Circuits Laboratory II** Prereq. 03.324 3 Lab., 2 Q.H.  
Further experimentation in electric circuits. Response to impulses; network parameters and synthesis; terminal characteristics of active devices

**03.327 Advanced Electronic Laboratory I** Prereq. 03.323 or 03.326 & 03.313 3 Lab., 2 Q.H.  
Experiments dealing with cathode and emitter followers, transistor amplifiers with negative feedback, directly coupled and difference amplifiers, Class B audio amplifier with transistors, push-pull amplifiers, drivers and distortion measurements. Vacuum tube and transistor type video amplifiers. Class C RF amplifiers and frequency doublers, audio and radio frequency oscillators including the crystal type.

**03.328 Advanced Electronic Laboratory II** Prereq. 03.327 3 Lab., 2 Q.H.  
Experiments dealing with Class B linear RF amplifiers and grid modulated amplifiers, plate modulation of Class C amplifier, clipping and clamping circuits. The diode detector, transients and square-wave testing of audio amplifiers. Pulse circuits and logic multivibrators, networks, in frequency modulation and audio equipment, analog computers.

**03.329 Advanced Electronic Laboratory III** Prereq. 03.328 3 Lab., 2 Q.H.  
Spectral studies of FM and PM waves, amplitude limiters, frequency modulation detectors. The balanced modulators and single sideband generators. Sawtooth generators, digital logic circuits, testing of a radio receiver, television receiver demonstrator. Pulse forming and delay lines, slotted lines and a series of five microwave experiments.

**03.331 Energy Conversion I** Prereq. 03.303 & 10.323 2 Cl., 2 Q.H.  
Generalized theory of rotating energy conversion devices. Consideration of the multiply excited direct-current machine; steady-state and dynamic properties; control of speed; special machines.

**03.332 Energy Conversion II** Prereq. 03.331 2 Cl., 2 Q.H.  
Transformer fundamentals. The single-phase transformer; no-load and load characteristics; equivalent circuits. Three-phase transformers, the polyphase-induction motor; equivalent circuits; steady-state and dynamic properties.

**03.333 Energy Conversion III** Prereq. 03.332 2 Cl., 2 Q.H.  
The synchronous machine; alternator characteristics involving synchronous impedance, power angle and voltage regulation. The synchronous motor. Dynamic properties as well as steady-state operation will be emphasized.

**03.334 Control Circuits I** Prereq. 03.305, 03.313  
& 03.333 2 Cl., 2 Q.H.  
Elements of control circuit devices; transfer functions; flow charts; frequency response.

**03.335 Control Circuits II** Prereq. 03.334 2 Cl., 2 Q.H.  
Consideration of control systems; stability criteria; dynamic analysis; compensation.

**03.336 Control Circuits III** Prereq. 03.335 2 Cl., 2 Q.H.  
Industrial control circuits; speed and voltage control; power rectifiers.

**03.337 Basic Power Systems I** Prereq. 03.305 & 03.333  
4 Cl., 4 Q.H.  
Consideration of power transmission lines; line constants; current, voltage and power relations; introduction to electric-power distribution loads, feeders and substations; voltage regulation theory and applications.

**03.338 Basic Power Systems II** Prereq. 03.337 4 Cl., 4 Q.H.  
Consideration of symmetrical and unsymmetrical faults; protective devices —application and coordination; power flow in electric circuits; steady-state power limitations of systems; stability criteria.

**03.339 Basic Power Systems III** Prereq. 03.338 4 Cl., 4 Q.H.  
Computer applications to power systems with emphasis on load-flow studies and basic ideas of system planning.

**03.341 Power and Controls Laboratory I** Prereq. 03.333 & 03.334  
or concurrently 4 Lab., 2 Q.H.  
Experimentation on measurement techniques, basic devices and circuits (including power circuits), transformers. Power measurements.

**03.342 Power and Controls Laboratory II** Prereq. 03.341  
4 Lab., 2 Q.H.  
Experimentation on the steady-state and dynamic characteristics of rotating machines.

**03.343 Power and Controls Laboratory III** Prereq. 03.342  
& 03.335 4 Lab., 2 Q.H.  
Experimentation on control devices, systems including servomechanisms, voltage and speed control systems.

**03.351 Bioelectronic Devices I** Prereq. 03.313 2 Cl., 2 Q.H.  
Transducers, relating body function to electrical voltages, and other electronic devices such as x-ray and diathermy machines, PH-meters and stimulators.

**03.352 Bioelectronic Devices II** Prereq. 03.351 2 Cl., 2 Q.H.  
The electrocardiograph, pulse recorders, electroencephalograph, electromyograph, physiograph, and radiation counting equipment.

**03.353 Bioelectronic Devices III** Prereq. 03.352 2 Cl., 2 Q.H.  
Blood pressure and flow measurements including ultrasonic devices, cell counters, spectrophotometers, nerve-conduction apparatus. Professional specialists in the field will lecture on special topics.

**03.357 Bioelectronic Laboratory I** Prereq. 03.313 3 Lab., 2 Q.H.  
Experiments cover laboratory equipment techniques, the impedance bridge, power supplies, transistor characteristics, triode vacuum tubes, silicon-controlled rectifiers, vacuum, gas, and crystal diodes. Attention is given to making precision of measurements in all experiments.

**03.358 Bioelectronic Laboratory II** Prereq. 03.357 3 Lab., 2 Q.H.  
Basic electronic experiments including direct-coupled and difference amplifiers, audio oscillators, R+F+ voltage amplifiers, pulse and counting circuits. Analogue computers. Geiger Counters. Ph Meters.

**03.359 Bioelectronic Laboratory III** Prereq. 03.358  
3 Lab., 2 Q.H.

This laboratory has the latest types of bioelectronic devices which include electroencephalograph, physiograph, activity counters, stimulators, psychological conditioning equipment, blood pressure and muscle movement. A complete isotope laboratory is also available.

**03.361 Transients in Linear Systems I** Prereq. 10.326, 03.319  
or Equivalent 2 Cl., 2 Q.H.

Methods employed in writing integrodifferential equations for electrical, mechanical, and electromechanical systems. Introduction to singularity functions and convolution.

**03.362 Transients in Linear Systems II** Prereq. 03.361  
2 Cl., 2 Q.H.

Network topology and duality, introduction to the methods of transformation calculus and complex frequency concepts. Signal analysis in the frequency domain, Fourier series, Fourier and Laplace transform methods.

**03.363 Transients in Linear Systems III** Prereq. 03.362  
2 Cl., 2 Q.H.

A varied selection of circuit problems are solved using Laplace transforms.

**03.364 Advanced Circuit Theory I** Prereq. 03.363 2 Cl., 2 Q.H.  
General analysis of networks by loop current and node voltage variables.

**03.365 Advanced Circuit Theory II** Prereq. 03.364 2 Cl., 2 Q.H.  
The two terminal pair conventional circuit theory.

**03.366 Advanced Circuit Theory III** Prereq. 03.365 2 Cl., 2 Q.H.  
Discussion of the necessary and sufficient conditions for the physical realizing of impedance functions; Foster and Cauer forms.

**03.367 Pulse and Digital Circuits I** Prereq. 03.363 2 Cl., 2 Q.H.  
Principle and techniques of pulse-forming circuits; applications to radar and digital computers emphasizing semiconductors.

**03.368 Pulse and Digital Circuits II** Prereq. 03.367 2 Cl., 2 Q.H.  
Analysis and design of gates, matrix switches and multivibrators.

**03.369 Pulse and Digital Circuits III** Prereq. 03.368 2 Cl., 2 Q.H.  
Analysis and design of blocking oscillators, sweep generators and delay lines.

**03.371 Analog and Digital Computers I** Prereq. 03.363  
2 Cl., 2 Q.H.  
Principles of the design and applications of analog computers; solutions of systems of equations, time and scale factors, simulation.

**03.372 Analog and Digital Computers II** Prereq. 03.371  
2 Cl., 2 Q.H.  
Digital circuit and logic topics including Boolean algebra, elementary switching theory, simple computing circuits.

**03.373 Analog and Digital Computers III** Prereq. 03.372  
2 Cl., 2 Q.H.  
A detailed treatment of Fortran computer programming, with engineering applications.

**03.374 Digital Systems I** Prereq. 03.319 2 Cl., 2 Q.H.  
Introduction to digital systems with respect to communications, computing, and control.

**03.375 Digital Systems II** Prereq. 03.374 2 Cl., 2 Q.H.  
Computing and control systems.

**03.376 Digital Systems III** Prereq. 03.375 2 Cl., 2 Q.H.  
Communication systems.

**03.377 Control Systems I** Prereq. 03.363 2 Cl., 2 Q.H.  
Analysis of linear servomechanisms under both transient and steady-state conditions.

**03.378 Control Systems II** Prereq. 03.377 2 Cl., 2 Q.H.  
Laplace transforms used in the formulation of block diagrams and transfer functions. System stability.

**03.379 Control Systems III** Prereq. 03.378 2 Cl., 2 Q.H.  
Treatment of Nyquist criteria, and Bode diagram methods for systems evaluation.

**03.381 Transistor-Circuit Engineering I** Prereq. 03.363  
2 Cl., 2 Q.H.

Introduction to semiconductor physics which avoids the use of higher mathematics.

**03.382 Transistor-Circuit Engineering II** Prereq. 03.381  
2 Cl., 2 Q.H.

Treatment of both equivalent circuit and the graphical methods of circuit analysis.

**03.383 Transistor-Circuit Engineering III** Prereq. 03.382  
2 Cl., 2 Q.H.

Audio and power amplifiers; r-f and pulse circuit applications.

**03.391 Special Projects I** Prereq. Consent of Instructor  
4 Cl., 4 Q.H.

A small group of advanced students will work on a specially designed project to apply basic knowledge and skills to a practical problem. The organization will be partly seminar and partly individual instruction.

**03.392 Special Projects II** Prereq. 03.391 4 Cl., 4 Q.H.  
Continuation of Special Projects I.

**03.393 Special Projects III** Prereq. 03.392 4 Cl., 4 Q.H.  
Continuation of Special Projects II.

## **Engineering Graphics and Computation**

**09.311 Engineering Graphics I** Prereq. None  
1 Cl., 2 Lab., 2 Q.H.

Introduction to engineering drawing, including geometric constructions and orthographic projection theory through auxiliary views.

**09.312 Engineering Graphics II** Prereq. 09.311  
1 Cl., 2 Lab., 2 Q.H.

Detail drawing, including intersections and development, reading of multi-view drawings, pictorial representation.

<b>09.313 Engineering Graphics III</b>	Prereq. 09.312 1 Cl., 2 Lab., 2 Q.H.
Production and interpretation of working drawings and hardware. Dimensioning and assembly drawing of mechanical devices. Introduction to Design.	
<b>09.314 Production Drawings and Design I</b>	Prereq. 09.313 1 Cl., 2 Lab., 2 Q.H.
Drawings and specifications for the production and precision machining of castings, forgings, weldments and sheet-metal stampings. Discussion of some common machine components.	
<b>09.315 Production Drawings and Design II</b>	Prereq. 09.314 1 Cl., 2 Lab., 2 Q.H.
Translatory and rotary motion involving basic mechanisms through graphical and mathematical analysis of displacement, velocity, and acceleration. Simple, compound, reverted and epicyclic gear trains.	
<b>09.316 Production Drawings and Design III</b>	Prereq. 09.315 1 Cl., 2 Lab., 2 Q.H.
Introduction to friction, chain and gear drives; plate, face and cylindrical cams for various types of followers; and introduction to empirical design through drawing projects.	
<b>09.351 Principles of Computer Programming I</b>	Prereq. 10.315 2 Cl., 2 Q.H.
Elementary methods and techniques of digital computer programming in the Fortran language applied to simple scientific problems.	
<b>09.352 Principles of Computer Programming II</b>	Prereq. 09.351 2 Cl., 2 Q.H.
Exploration of extended capabilities of the Fortran language and development of the logic and general principles of programming.	
<b>09.353 Principles of Computer Programming III</b>	Prereq. 09.352 2 Cl., 2 Q.H.
Case studies involving professionally written programs with introductions to associated techniques and mathematics.	

## Mathematics

<b>10.301 Introduction to Mathematics I</b>	Prereq. None 4 Cl., non-credit
A comprehensive review of high school algebra including: first-degree equations, factoring, fractional equations, word problems, and concepts of plane geometry.	

<b>10.302 Introduction to Mathematics II</b>	Prereq. 10.301 4 Cl., non-credit
Algebraic operations with fractions and mixed expressions, proportions, square roots, radicals, quadratics; simultaneous equations, graphs and fractional exponents. The geometry of the right triangle, areas of polygons, circles, and loci problems. Basic slide rule operation.	
<b>10.311 Algebra I</b>	Prereq. Math. Placement Test or 10.302 2 Cl., 2 Q.H.
First part of a rapid but thorough study of algebra—fundamental operations; algebraic fractions; exponents and radicals; functions; linear equations.	
<b>10.312 Algebra II</b>	Prereq. 10.311 2 Cl., 2 Q.H.
Quadratic equations and applications; radical equations; complex numbers; binomial expansion; variation; roots of polynomial equations.	
<b>10.313 Trigonometry I</b>	Prereq. Math. Placement Test or 10.302 2 Cl., 2 Q.H.
The trigonometric functions of angles both in degree and in radian measure; solution of right triangles and applications; trigonometric identities and equations.	
<b>10.314 Trigonometry II</b>	Prereq. 10.313 2 Cl., 2 Q.H.
Graphs involving trigonometric functions and other transcendental functions; logarithms and computation; inverse trigonometric functions; applied problems.	
<b>10.315 Introduction to Calculus</b>	Prereq. 10.312, 10.314 4 Cl., 4 Q.H.
Analysis of the straight line; functions and limits; differentiation and integration of algebraic functions, with applications; study of circles and conic sections.	
<b>10.321 Calculus I</b>	Prereq. 10.315 2 Cl., 2 Q.H.
Calculus of non-algebraic functions; parametric forms; curvilinear motion; polar coordinates; indeterminate forms; curve tracing.	
<b>10.322 Calculus II</b>	Prereq. 10.321 2 Cl., 2 Q.H.
Integration methods; improper integrals; applications of integration.	
<b>10.323 Calculus III</b>	Prereq. 10.322 2 Cl., 2 Q.H.
Infinite series; expansion of functions; hyperbolic functions; partial differentiation; multiple integrals.	
<b>10.324 Differential Equations I</b>	Prereq. 10.323 2 Cl., 2 Q.H.
Vector analysis; matrices and linear algebra.	

**10.325 Differential Equations II** Prereq. 10.324 2 Cl., 2 Q.H.  
 Ordinary differential equations—standard types of the first order; linear differential equations, especially with constant coefficients. Laplace transforms.

**10.326 Differential Equations III** Prereq. 10.325 2 Cl., 2 Q.H.  
 Series solutions of differential equations; Fourier series and orthogonal functions.

**10.351 Advanced Mathematics I** Prereq. 09.353 & 10.326  
 2 Cl., 2 Q.H.  
 Introduction to numerical methods—applied problems employing the electronic computer.

**10.352 Advanced Mathematics II** Prereq. 10.351 2 Cl., 2 Q.H.  
 Introduction to partial differential equations, boundary-value problems, Sturm-Lionville systems.

**10.353 Advanced Mathematics III** Prereq. 10.352 2 Cl., 2 Q.H.  
 Special topics in analysis.

## Physics

*Courses marked \* not available in every curriculum. See curricula in Programs of Instruction section, for applicable sequence, pp. 48-94.*

**11.301 Introductory Physics I** Prereq. None 2 Cl., Non-credit  
 A survey of physical principles and theories related to field of mechanics. A relatively non-mathematical approach is used.

**11.302 Introductory Physics II** Prereq. 11.301 2 Cl., Non-credit  
 Extension of principles in mechanics and introduction of concepts in electricity and magnetism.

\***11.304 General Physics I** Prereq. 10.311, 312, 313, 314 & 315 or concurrently 2 Cl., 2 Q.H.  
 Survey of Newtonian mechanics; kinematics and dynamics of particle motion; projectile and circular motion; rotational motion, conservation laws of energy and momentum.

\***11.305 General Physics II** Prereq. 11.304 2 Cl., 2 Q.H.  
 Temperature; heat energy; mechanical equivalent of heat; wave motion; sound; Doppler's effect; properties of light; simple optical systems.

**\*11.306 General Physics III** Prereq. 11.305 2 Cl., 2 Q.H.  
Fundamentals of electricity and magnetism; fields; potential; electric current; inductance; capacitance; electromagnetism; a-c and d-c series circuits.

**\*11.311 Physics I** Prereq. 10.311 or concurrently 2 Cl., 2 Q.H.  
Kinematics and dynamics of particle motion; Newton's laws; law of gravitation; projectile, circular and relative motions.

**\*11.312 Physics II** Prereq. 11.311 2 Cl., 2 Q.H.  
Work; energy; momentum; conservation laws; kinematics and dynamics of rotation; simple harmonic motion.

**\*11.313 Physics III** Prereq. 11.312 2 Cl., 2 Q.H.  
Electrostatics; magnetism; magnetic induction; induced currents; electrical instruments; direct and alternating current and series circuits.

**\*11.314 Physics IV** Prereq. 11.313 2 Cl., 2 Q.H.  
Properties of matter; wave motion; intensity; interference phenomena; beats; Doppler effect; vibrating systems.

**\*11.315 Physics V** Prereq. 11.314 2 Cl., 2 Q.H.  
Temperature; heat; molar heat; change of state; calorimetry; heat transfer; kinetic theory of gases; general gas laws; laws of thermodynamics.

**\*11.316 Physics VI** Prereq. 11.315 2 Cl., 2 Q.H.  
Properties of light; reflection; refraction; dispersion; optical systems; diffraction; interference phenomena; polarization.

**11.321 Particles and Waves I** Prereq. 11.316 2 Cl., 2 Q.H.  
Application of fundamental principles of waves to electromagnetic radiation.

**11.322 Particles and Waves II** Prereq. 11.321 2 Cl., 2 Q.H.  
Selected topics in antennas and waveguides. Properties of atoms and electrons as related to conduction of electricity in solids.

**11.323 Particles and Waves III** Prereq. 11.322 2 Cl., 2 Q.H.  
Fundamentals of semiconductors, crystal diodes, and transistors.

**11.331 Advanced Physics I** Prereq. 11.323 & 10.323 2 Cl., 2 Q.H.  
Atomic structure of matter; quantization; Bohr theory of atomic spectra; X-ray; radiation.

**11.332 Advanced Physics II** Prereq. 11.331 2 Cl., 2 Q.H.  
Introduction to quantum mechanics; de Broglie hypothesis; waves and particles; Pauli exclusion principle and quantum number; spectra.

**11.333 Advanced Physics III** Prereq. 11.332 2 Cl., 2 Q.H.  
Introduction to theory of relativity; Lorenz transformations; mass and energy; elementary particles; nuclear reactions and transformation of matter and energy.

**11.341 Physics Laboratory I** Prereq. 11.316 3 Lab., 2 Q.H.  
Experiments covering the fundamental concepts of physics in the fields of mechanics, electricity, and magnetism.

**11.342 Physics Laboratory II** Prereq. 11.341 3 Lab., 2 Q.H.  
Experiments covering electromagnetic phenomena, heat, and sound.

**11.343 Physics Laboratory III** Prereq. 11.342 3 Lab., 2 Q.H.  
Experiments covering optics and related topics in the area of modern physics.

## Chemistry

**12.301 Introductory Chemistry I** Prereq. None 2 Cl., Non-credit  
A non-mathematical approach to the concepts of chemistry including matter, elements and compounds, chemical bonding, chemical equations.

**12.302 Introductory Chemistry II** Prereq. 12.301 2 Cl., Non-credit  
A continuation of 12.301, including Periodic System, forms of energy, oxidation-reduction, solutions, chemical and ionic equilibrium, nuclear reactions, and a brief introduction to organic chemistry.

**12.311 General Chemistry I** Prereq. None 2 Cl., 2 Q.H.  
Fundamental ideas of matter and energy, properties of gases, liquids and solids; atomic structure; chemical bonding and valence; classification of the elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes; chemical equilibrium.

**12.312 General Chemistry II** Prereq. 12.311 2 Cl., 2 Q.H.  
Ionic reactions and ionic equilibrium; oxidation-reduction reactions; electrochemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of metals and non-metals; study of families of elements in the Periodic System.

**12.313 General Chemistry III** Prereq. 12.312 2 Cl., 2 Q.H.  
Chemistry of related and similar metals; coordination compounds; chemistry of organic compounds, both open and closed-chain compounds; organic chemistry of natural and synthetic products, including petroleum, rubber, synthetic resins, plastics, etc.

**12.314 General Chemistry and Laboratory I** Prereq. None  
2 Cl., 2 Lab., 3 Q.H.  
Fundamental ideas of matter and energy. Properties of gases, liquids and solids; atomic structure, chemical bonding and valence; classification of the elements; acids and bases; solutions of non-electrolytes; solutions of electrolytes; chemical equilibrium. Correlated laboratory experiments.

**12.315 General Chemistry and Laboratory II** Prereq. 12.314  
2 Cl., 2 Lab., 3 Q.H.  
Ionic reactions and ionic equilibrium; oxidation-reduction reactions; electrochemistry; chemical kinetics; colloidal dispersions; nuclear chemistry; chemistry of non-metals and metals; study of families of elements in the Periodic System. Correlated laboratory experiments.

**12.316 General Chemistry and Laboratory III** Prereq. 12.315  
2 Cl., 2 Lab., 3 Q.H.  
Chemistry of related and similar metals; coordination compounds; chemistry of open and closed chain organic compounds; organic chemistry of natural and synthetic products including petroleum, rubber, synthetic resins, plastics, etc. Correlated laboratory experiments.

**12.321 Analytical Chemistry I** Prereq. 12.313 or 12.316  
2 Cl., 2 Q.H.  
Analytical procedure and technique; application of fundamental concepts of solutions to laboratory work; formulation of numerical terms essential to understanding mass action law, ionic equilibria; solubility product, hydrolysis, and redox constants.

**12.322 Analytical Chemistry II** Prereq. 12.321 2 Cl., 2 Q.H.  
Weighing, measurement of volumes, titration, filtration, ignition, and combustion are considered from standpoint of theoretical principles involved and manipulative technique necessary. Combination of these operations and their application to actual analysis; comprehensive study of volumetric methods and more elementary parts of gravimetric analysis. Problems are introduced to emphasize correct calculation of analytical results as well as procedures.

**12.323 Analytical Chemistry III** Prereq. 12.322 2 Cl., 2 Q.H.  
Elements of instrumental analysis. Theoretical principles involved in the use of colorimeter, absorption instruments, Ph measurements, chromatography, etc.

**12.324 Analytical Chemistry Laboratory I** Prereq. 12.316 or equivalent & 12.321 or concurrently 3 Lab., 2 Q.H.  
Principles of qualitative chemistry applied to actual problems. Separations and identifications of known and unknown solutions. Finally these are combined into a comprehensive system of analysis which is applied to artificially prepared mixtures and industrial materials.

**12.325 Analytical Chemistry Laboratory II**

Prereq. 12.324 3 Lab., 2 Q.H.

Analytical methods used in quantitative chemistry. Volumetric analysis including acidimetry and alkalimetry, oxidation, reduction, and precipitation methods followed by simple gravimetric analyses.

**12.326 Analytical Chemistry Laboratory III**

Prereq. 12.325

3 Lab., 2 Q.H.

Practical applications of instrumental analysis with experience in the use of colorimeter, absorption instruments, pH measurements, chromatography, etc.

**12.331 Organic Chemistry I**

Prereq. 12.313 or 12.316

2 Cl., 2 Q.H.

General principles of structure, nomenclature, preparation, uses, and reactions of hydrocarbons; paraffin, olefin, cyclo paraffin, acetylene and aromatic hydrocarbons and certain of their derivatives, types and mechanisms of organic reactions; carbonaceous minerals and fuels.

**12.332 Organic Chemistry II**

Prereq. 12.331 2 Cl., 2 Q.H.

General principles of structure, nomenclature, preparation, uses, and reactions of the various types of organic compounds including: alcohols and phenols, halogen compounds, others, aldehydes, ketones, carboxylic acids and their derivatives, amines, diazonium compounds, absorption of light by organic compounds will be studied.

**12.333 Organic Chemistry III**

Prereq. 12.332 2 Cl., 2 Q.H.

Sulfur compounds, substituted acids, amino acids, quinones, redox and acid-base indicators, optical isomerism, carbohydrates, macromolecules and the chemistry of heterocycles.

**12.334 Organic Chemistry Laboratory I**

Prereq. 12.316

or equivalent &amp; 12.331

or concurrently 3 Lab., 2 Q.H.

Co-ordinated with the lecture course, Organic Chemistry I, and deals with the preparation and properties of compounds discussed.

**12.335 Organic Chemistry Laboratory II**

Prereq. 12.334

3 Lab., 2 Q.H.

Co-ordinated with the lecture course, Organic Chemistry II, and deals with the preparation and properties of compounds discussed.

**12.336 Organic Chemistry Laboratory III**

Prereq. 12.335

3 Lab., 2 Q.H.

Co-ordinated with the lecture course, Organic Chemistry III, and deals with the preparation and properties of compounds discussed.

**12.341 Physical Chemistry I**

Prereq. 12.313 or 12.316

2 Cl., 2 Q.H.

The three states of matter, atomic and molecular forces, physical properties and molecular structure; heat, work and heat capacity; thermochemistry.

**12.342 Physical Chemistry II**

Prereq. 12.341 2 Cl., 2 Q.H.

Thermodynamics, solutions, chemical equilibria, phasediagrams, and chemical kinetics.

**12.343 Physical Chemistry III**

Prereq. 12.342 2 Cl., 2 Q.H.

Electrical conductance, electromotive force, ionic equilibria, colloids, quantum theory, and photochemistry.

**12.351 Instrumental and Radiochemistry I**

Prereq. 12.323

2 Cl., 2 Q.H.

Definitions, physical principles, scope and application; principles of measurement; endpoint-detection systems for volumetric analysis, data treatment and interpretation. Optical methods of analysis including spectrophotometry, excitation methods, measurement of other optical properties, and mass spectrometry.

**12.352 Instrumental and Radiochemistry II**

Prereq. 12.351

2 Cl., 2 Q.H.

Methods of separation, vapor phase chromatography, ion exchangers; electrical methods of analysis including potentiometry, voltammetry, coulometry, and conductimetry; miscellaneous instrumental measurements.

**12.353 Instrumental and Radiochemistry III**

Prereq. 12.352

2 Cl., 2 Q.H.

Radioactivity and nuclear reactions, production and study of nuclear reactions, equations of radioactive decay, nuclear states and radioactive processes, interaction of radiations with matter, radiation detection and measurement, statistics of radioactivity measurements, techniques for the study of radionuclides, tracers in chemical applications and nuclear energy.

**12.381 Nuclear Technology I**

Prereq. 10.323 &amp; 11.316

2 Cl., 2 Q.H.

Atomic and nuclear structure, discovery and nature of radio activity. Nuclear reactions and energy; induced nuclear transformations; neutron properties; applications of radionuclides. Supplementary laboratory experiments.

**12.382 Nuclear Technology II**

Prereq. 12.381 2 Cl., 2 Q.H.

Radiological safety—the hazards, problems, and protection. Nuclear instrumentation for particle detection, monitoring and experimentation. Supplementary laboratory experiments.

**12.383 Nuclear Technology III** Prereq. 12.382 2 Cl., 2 Q.H.  
The fission process and its applications; nuclear reactors—their classification, design and application; nuclear fuel processing; radioactive waste disposal. Supplementary laboratory experiments.

## Natural Science

**16.531 Oceanography I** 2 Q.H.  
An introduction to the geology of the ocean basins and the physical and chemical properties of sea water. The development of ocean currents and their effect on the land masses of the world.

**16.532 Oceanography II** Prereq. 16.531 2 Q.H.  
The habitat zones and organisms of the sea. Phytoplankton, zooplankton, and nekton are discussed. The growing economic importance of marine resources for the expanding world population.

**16.533 Marine Geology** 2 Q.H.  
Physiography and structure of ocean basins. Marine geological processes and features, including sedimentation, erosion, shorelines, and bottom topography. Methods and techniques of marine geological exploration.

**16.541 Meteorology I** 2 Q.H  
Introduction to the structure, composition and phenomena of the atmosphere. Consideration of solar radiation, aurora, airglow, meteors, and radio propagation in the upper atmosphere, followed by a detailed examination of the major weather elements, related measuring instruments and global wind circulation of the troposphere. Laboratory exercises include plotting horizontal and vertical variations in temperature, pressure, and moisture, with analysis of the dynamic interrelationships involved.

**16.542 Meteorology II** Prereq. 16.541 2 Q.H.  
Study of secondary wind circulation, air masses, frontal systems, thunderstorms, hurricanes, and tornadoes. Techniques in local short-range and regional long-range forecasting, with special attention to New England conditions. Laboratory exercises in synoptic weather maps preparation, analysis, and interpretation.

**16.543 Climatology** 2 Q.H.  
Classification, analysis, and geographic distribution of climatic types. Consideration of microclimates and relationship of weather and climatic elements to other factors in the natural environment and human activities. Opportunity provided to apply effects of these elements to a chosen area of personal interest.

## Biology

<b>18.311 General Biology and Laboratory I</b>	3 Cl., 3 Lab., 4 Q.H.
Fundamental concepts of the physical, chemical, and biological characteristics and behavior of protoplasm and cells. Plant and animal histology.	
<b>18.312 General Biology and Laboratory II</b>	Prereq. 18.311 3 Cl., 3 Lab., 4 Q.H.
Plant and animal metabolism, maintenance of internal environment, gametogenesis and cell division.	
<b>18.313 General Biology and Laboratory III</b>	Prereq. 18.312 3 Cl., 3 Lab., 4 Q.H.
Fundamentals of genetics and eugenics; embryology; plant life history.	
<b>18.314 Botany I</b>	Prereq. 18.313 2 Cl., 2 Q.H.
The plant cell, tissues, and parts of flowering plants.	
<b>18.315 Botany II</b>	Prereq. 18.314 2 Cl., 2 Q.H.
Classification of the plant kingdom, plantal life histories.	
<b>18.316 Botany III</b>	Prereq. 18.315 2 Cl., 2 Q.H.
Physiology and life activities of plants.	
<b>18.321 Microbiology I</b>	Prereq. 18.313 2 Cl., 4 Lab., 4 Q.H.
Biology of bacteria and other microorganisms, preparation of media, sterilization, staining, isolation, and identification of pure cultures.	
<b>18.322 Microbiology II</b>	Prereq. 18.321 2 Cl., 4 Lab., 4 Q.H.
Bacteriology of water, sewage, air, and milk. Standards, plate counts, and physiological tests.	
<b>18.323 Microbiology III</b>	Prereq. 18.322 2 Cl., 4 Lab., 4 Q.H.
Intermediary metabolism.	
<b>18.324 Anatomy and Physiology I</b>	Prereq. None 1 Cl., 3 Lab., 2 Q.H.
The structure and function of vertebrate organ systems.	
<b>18.325 Anatomy and Physiology II</b>	Prereq. 18.324 1 Cl., 3 Lab., 2 Q.H.
Introduction to cellular metabolism.	

**18.326 Anatomy and Physiology III** Prereq. 18.325  
1 Cl., 3 Lab., 2 Q.H.  
Continuation of the study of cellular metabolism.

**18.341 Hematology I** Prereq. 18.313 1 Cl., 3 Lab., 2 Q.H.  
Basic hematological techniques including discussion of the differential smear and observation of the normal morphology of red cells, white cells and platelets. Some animal hematology included.

**18.342 Hematology II** Prereq. 18.341 1 Cl., 3 Lab., 2 Q.H.  
Morphologic and etiologic classification of the anemias. Related diagnostic tests will be discussed.

**18.343 Hematology III** Prereq. 18.342 1 Cl., 3 Lab., 2 Q.H.  
Studies of pathologic and physiologic deviations of the white cell series as observed in leukemias and infections. Diagnostic methods and treatment will be discussed.

**18.351 Histology-Organology I** Prereq. 18.313 1 Cl., 2 Lab., 2 Q.H.  
The morphology of cells and tissues.

**18.352 Histology-Organology II** Prereq. 18.351 1 Cl., 2 Lab., 2 Q.H.  
The tissue components of the integumentary, digestive, and respiratory systems.

**18.353 Histology-Organology III** Prereq. 18.352 1 Cl., 2 Lab., 2 Q.H.  
The tissue components of the excretory, reproductive, and endocrine systems.

**18.357 Genetics I** Prereq. 18.313 2 Cl., 2 Q.H.  
Mitosis, meiosis, and mendelian genetics.

**18.358 Genetics II** Prereq. 18.357 2 Cl., 2 Q.H.  
Chromosome mapping, mutations, translocation, chromosomal abberations.

**18.359 Genetics III** Prereq. 18.358 2 Cl., 2 Q.H.  
Population genetics, aspects of biochemical genetics.

**18.391 Photomicroscopy** Prereq. 1 Cl., 2 Lab., 2 Q.H.

## Pharmacology

**73.311 Clinical Biochemical Technology I** Prereq. 12.323, 12.333,  
18.323 3 Cl., 3 Lab., 4 Q.H.  
Enzymes and hormones of clinical and pathologic interest with experiments  
to interpret disordered biochemistry.

**73.312 Clinical Biochemical Technology II** Prereq. 73.311  
3 Cl., 3 Lab., 4 Q.H.  
Pathogenesis of renal tubular dysjunction, intestinal malabsorption syndromes, hormone assay and significance, and endocrine functions.

**73.313 Clinical Biochemical Technology III** Prereq. 73.312  
3 Cl., 3 Lab., 4 Q.H.  
Abnormality of electrolyte metabolism, lipid transport and mobilization histochemical technics, vitamin abnormalities, clinical aspects of biochemical genetics and radioisotopic applications.

## Liberal Arts

Students wishing to elect other Humanities, Social Science, and Natural Science courses should refer to the University College Catalog and petition for approval by the Committee on Education of Lincoln College.

**19.501, 19.502, 19.503 Psychology I, II, III** 6 Q.H.  
An introductory survey of the general field of psychology. The first term will cover the historical backgrounds of psychology, experimental design and research in psychology, growth and development, psychological testing and the measurement of intelligence. The second term will include the physiological basis of behavior, motivation and emotion, sensation and perception, and social psychology. The third term topics include learning, problem solving, cognition, and the study of normal and abnormal personalities.

**21.501, 21.502, 21.503 Sociology I, II, III** Prereq. 30.506 6 Q.H.  
Basic concepts and theories relating to the study of man as a participant in group life with emphasis on social structure, socialization, social stratification, collective behavior, population, and the major institutional areas.

**23.501 Western Civilization I** 2 Q.H.  
The beginnings of Western civilization with emphasis on the political, economic, and social history of the ancient and medieval world.

**23.502 Western Civilization II** 2 Q.H.  
Modern Europe to 1815 with an examination of the two major intellectual movements—the Renaissance and the Enlightenment—and their impact upon religious movements, economic developments, and the rise of national states.

**23.503 Western Civilization III** 2 Q.H.

Western civilization since 1815, emphasizing the Scientific and Industrial Revolutions and their impact upon democracy and authoritarianism, nationalism and internationalism, and war and peace.

**30.504, 30.505, 30.506 English I, II, III** 6 Q.H.

Review of grammar and punctuation through drill. A study of the techniques of exposition, description, argumentation, narration, and documentation; frequent theme assignments to develop skill in writing; related readings.

Students enrolling in English (30.501) will be given a diagnostic test during the first meeting of class. The purpose of this test is to determine whether the student's level of preparation in English is sufficient to enable him to do the work required in the course. If his score indicates that he falls below the minimum level required, he will be given information about obtaining additional preparation from the Center for Programmed Study which is located in the Ell Building.

**30.507, 30.508, 30.509 Introduction to Literature I, II, III**

Prereq. 30.506 6 Q.H.

Short stories, plays, poems, and the novel. Writing of short critique papers.

## **Business Management**

Students wishing to elect other business courses should refer to the University College catalogue and petition for approval by the Committee on Education of Lincoln College.

**39.501, 39.502, 39.503 Economic Principles and Problems I, II, III**

6 Q.H.

Introduction to economic theory and problems. Business cycles, money and banking system, fiscal policy, economic growth, fluctuations in national income as well as the economic problems of monopoly, industrial relations, international economic problems and competing economic systems. Emphasis is placed on basic principles and laws and consideration is given to current economic problems.

**39.510 Statistics for Quality Control**

Prereq. 10.503 or equiv.  
2 Q.H.

Fundamentals of statistical concepts and computations necessary to the understanding of statistical quality control. Frequency distributions, measures of centering and dispersion; computation of average and standard deviation for ungrouped and grouped data; determination of areas under the normal distribution curve; standard deviation of the mean. Combinations and permutations and their use of compute probabilities computations associated with the hypergeometric, binomial and Poisson distributions.

**39.511, 39.512, 39.513 Statistics I, II, III** Prereq. 39.503 6 Q.H.  
Statistical techniques and their application; descriptive measures of shape, location and dispersion; an introduction to probability; sampling and simple analysis of observed distributions; advanced concepts in probability; sampling and statistical inference; time series analysis; correlation and index numbers.

**41.501, 41.502, 41.503 Accounting Principles I, II, III** 6 Q.H.  
A basic course in accounting designed to familiarize students with the fundamental accounting principles with a background to business through accounting. Emphasis is placed on understanding the basic accounting process and the analytical and interpretive aspects of accounting as a managerial tool.

**45.501 Management and Organization I** Prereq. None 2 Q.H.  
Set the scope and environment of business viewing its general operation in our society, its influences and its responsibilities as seen through the roles played by the individual and the group; introduce the basic management functions and organizational structures and show managerial performance in some of the fundamental areas of business activity.

**45.502 Management and Organization II** Prereq. 45.501 2 Q.H.  
Analyze each of the basic management functions establishing the essential nature of the functions for effective organized group action, the interrelationship of the functions and the universality of application of the functions to all kinds and all levels of business enterprise.

**45.503 Management and Organization III** Prereq. 45.502 2 Q.H.  
Create better comprehension of the art of management stressing managerial decision-making and performance applied to operational business requirements.

**45.510 Labor Management Relations** Prereq. 39.503 2 Q.H.  
History of the labor movement and American industrial relations developments, law and institutions; theory of collective bargaining and the practice of management and of unions; bargaining negotiations, strikes and public policy in industrial relations and wage bargaining; employment problems, economic growth and structure change.

**45.541 Law I—Contracts** Prereq. None 2 Q.H.  
Contracts: nature, kinds and formation of contracts; essential elements; form and interpretation of contracts; breach, remedies and damages.

**45.542 Law II—Agency and Sales** Prereq. 45.541 2 Q.H.  
Agency: nature, purpose and formation of agency relationships; rights and duties of principal and agent, scope of agent's authority; rights and duties of principal and third persons; termination of agency.

Sales: nature of sales contracts; warranties; transfer of title; rights and remedies of seller and buyer.

**45.551 Law for Engineers**

Prereq. 45.542 2 Q.H.

Legal phases of engineering including public law, property law, zoning, patents.

**45.561 Statistical Quality Control I**Prereq. 39.513 or  
39.510 2 Q.H.

Description and practical application of the basic statistical quality control methods for quality assurance, quality control and quality improvement of products and services. The tools for reducing and controlling the costs of scrap, rework, repair, customer complaints and warranty.

The determination of process capability; use of histograms to identify abnormal variability; the use of quality control charts for measurable and non-measurable quality characteristics, including Stewhart, Multi-Vari, median, percent defective and defects per unit; corrective action techniques; complying to government quality control system requirements; psychological factors in controlling quality.

**45.563 Management of Quality Control**

2 Q.H.

Modern concepts of managing the quality function of a company to maximize customer satisfaction at minimum quality cost. Measurement of quality losses and expenses; design of programs of quality improvement; use of Pareto's Rule to identify unsolved quality problems, methods of diagnosis of defect causes. Organization of the quality function; planning for quality; quality control engineering; inspection; quality assurance; quality audit.

**45.570, 45.571, 45.572 Electronic Data Processing I, II, III**

6 Q.H.

The first two quarters are planned to acquaint the executive, accountant, and the methods and systems analyst with automatic electronic equipment and its potential applications. This includes a comprehensive survey of the machine components of such systems, their characteristics, and assembly to handle various business accounting problems; comparison of speed, capacity, flexibility, reliability and cost; discussion of input and output devices, memory (storage), arithmetic and control elements; elementary programming, number systems; integrated data processing in businesses, such as retail sales, inventory, payroll, and banking accounting. The third quarter is spent in the study of the use of EDP as a tool of management.

This study includes the use of EDP in areas such as forecasting, inventory, production scheduling and distribution. The basic principles of operations research and their application to business problems; the use of PERT as a scheduling and control technique. Hybrid centralized/decentralized management through computer time-sharing. Other trends.

## Health Care Administration

**86.501 Medical Terminology**

2 Q.H.

A study of the terminology utilized in the patient care setting for students without medical or nursing backgrounds. Stems; prefixes; suffixes commonly encountered in hospital and other patient-care activities.

**86.502 Hospital Law and Ethics**

2 Q.H.

A study of important legal principles and rulings of importance to medical records administrators; hospital administrative personnel; nurses; and others. Brief introduction to interpersonal ethics in the health-care setting.

**86.504, 86.505, 86.506 Foundations of Medical Science I, II, III** 6 Q.H.

Study, primarily through physicians' lectures, of the major disease problems in our society, with an overview of modes of treatment. This course is intended to provide the student with a non-medical background with some appreciation of the problems faced by the physician in his daily practice, in order to facilitate communication between medical and non-medical members of the health-care team.



# **The Lincoln College Faculty**

THE STRENGTH of an educational institution lies in the quality of its faculty. This is especially true in a college devoted to the training of mature men and women, many of whom are already employed in their chosen professions.

The instructional staff of Lincoln College is composed of professional academicians from Northeastern University and neighboring educational institutions and practicing professionals from the scientific and industrial community of Greater Boston. The theoretical training and practical experience represented by this combination of specialists is ideally suited to the technology programs they teach and the adult students they serve.

The faculty are selected for their ability and active interest in the welfare of ambitious part-time students. They are men and women of culture and high ideals and are qualified by educational training and professional experience to teach effectively in their respective fields.

A staff of experienced professional educators who serve as program and course consultants, constitute the Academic Advisory Council and Curriculum Advisory Committee of the College. They guide, supervise and assist with the administration of courses and programs.

## **The Faculty**

*(As of March 1, 1967)*

The following is an alphabetical list of the faculty of Lincoln College. Year of appointment, colleges and universities attended, degrees earned, professional affiliation and titles and Lincoln College department are listed.

<b>George H. Anderson</b>	Appointed 1956
Commercial Art Diploma, Vesper George School of Art, 1948; Professional Artist; Free Lance Technical Illustrator.	
<i>Engineering Graphics and Computation</i>	

<b>Paul A. Andrews</b>	Appointed 1959
B.A. Boston University, 1951; M.S. Northeastern University, 1957; Associate Scientist, Polaroid Corporation.	
<i>Chemistry</i>	
<b>Robert B. Angus, Jr.</b>	Appointed 1950
B.S. Northeastern University, 1947; M.S. Harvard University, 1953; P.E. (Mass.); Senior Engineering Specialist in the Communications Systems Laboratory, Sylvania Electric Products, Inc.	
<i>Electrical Engineering Technology</i>	
<b>Roger M. Antoine</b>	Appointed 1955
Baccalaureate, Marseille University, 1942; Licence es-Science, Marseille University, 1945; Diploma of Meteorology, Marseille University, 1946; Diploma of Engineering, Marseille School of Engineering, 1946; Associate Professor of Mathematics, Northeastern University.	
<i>Mathematics</i>	
<b>Louis E. Ashley</b>	Appointed 1966
A.B. Boston University, 1952; Senior Staff Scientist, Avco Corporation Space Systems Division.	
<i>Mechanical Engineering Technology</i>	
<b>Robert J. Averill</b>	Appointed 1957
B.S. Northeastern University, 1957; M.S. Northeastern University, 1959; Cambridge Electron Accelerator, Harvard University.	
<i>Course Consultant for Electrical Engineering Technology</i>	
<b>Russell H. Babcock</b>	Appointed 1954
S.B. Tufts College, 1945; S.M. Harvard University, 1947; Diplomate, American Academy of Environmental Engineers; P.E. (Mass., Maine, N.H., R.I., Vermont); Manager, Water and Waste Division, The Foxboro Co.	
<i>Civil Engineering Technology</i>	
<b>Hollis Baird</b>	Appointed 1945
Assistant Professor of Electrical Engineering, Northeastern University; Consulting Engineer, Radio and Television.	
<i>Program Consultant for Electronic Engineering Technology</i>	
<b>John C. Balsavich</b>	Appointed 1957
Massachusetts Radio School, 1956; Electronic Technician, Northeastern University.	
<i>Electrical Engineering Technology</i>	
<b>Joseph E. Barbeau</b>	Appointed 1966
B.S. Northeastern University, 1955; M.Ed. Northeastern University, 1966; Assistant Professor, Department Co-operative Education, Northeastern University.	
<i>Chemistry</i>	

<b>William T. Barry, Jr.</b>	Appointed 1956
Massachusetts Institute of Technology, 1930–1932; Graduate American Institute of Banking; Tax Accountant, State Street Bank and Trust Company.	
<i>Engineering Graphics and Computation</i>	
<b>Eugene R. Bartlett</b>	Appointed 1958
B.S.E.E. Northeastern University, 1957; M.S.E.E. Northeastern University, 1959; P.E. (Mass.); Research Associate, Northeastern University.	
<i>Electrical Engineering Technology</i>	
<b>Robert T. Bateman</b>	Appointed 1957
B.S. University of New Hampshire, 1937; M.A. University of Maine, 1950; Head of Mathematics Department, Wellesley Senior High School.	
<i>Mathematics</i>	
<b>G. Warren Bates</b>	Appointed 1949
B.S. Massachusetts Institute of Technology, 1926; M.A. Boston University, 1937; Instructor, Medford High School.	
<i>Mathematics</i>	
<b>Adolph Baumann</b>	Appointed 1955
B.S. Kantonales Technikum, Winterthur, Switzerland, 1940; Graduate Studies, Massachusetts Institute of Technology, 1952–1956; Technical Staff, Radio Corporation of America.	
<i>Electrical Engineering Technology</i>	
<b>Stanley A. Beecoff</b>	Appointed 1957
A.E. Lincoln Institute, 1957; B.B.A. Northeastern University, 1961; M.B.A. Northeastern University, 1966; Factory Manager, Dynisco Division of Abex Corporation.	
<i>Electrical Engineering Technology</i>	
<b>Matteo P. Berardi</b>	Appointed 1960
B.S. Northeastern University, 1960; M.S. Northeastern University, 1962; Senior Scientist, Avco Corporation Space Systems Division.	
<i>Mechanical Engineering Technology</i>	
<b>Alfred L. Birch</b>	Appointed 1965
B.S.E.E. University of Connecticut, 1952; P.E. (Mass.); Department Head, Development Engineering, Western Electric Co.	
<i>Electrical Engineering Technology</i>	
<b>Emmanuel E. Bliamptis</b>	Appointed 1965
B.S. University of Rhode Island, 1955; S.M. Massachusetts Institute of Technology, 1958; Research Physicist, Air Force Cambridge Research Laboratories.	
<i>Physics</i>	

<b>Joseph I. Bluhm</b>	Appointed 1966
S.B. Massachusetts Institute of Technology, 1941; M.S. Massachusetts Institute of Technology, 1953; Chief, Applied Mechanics Research Laboratory, U.S. Army Materials Research Agency.	
<i>Mechanical Engineering Technology</i>	
<b>Sidney Bluhm</b>	Appointed 1965
A.B. Harvard College, 1932; Ed.M. Boston Teachers College, 1933; A.M. Boston University, 1951; Head of Science Department, Boston Technical High School.	
<i>Physics</i>	
<b>Edward Bobroff</b>	Appointed 1946
B.M.E. Polytechnic Institute of Brooklyn, N.Y., 1940; P.E. (Mass.); Chief Engineer, Combat Systems, Boston Naval Shipyard.	
<i>Mathematics</i>	
<b>Fletcher S. Boig</b>	Appointed 1945
B.S. Tufts College, 1932; M.S. Massachusetts Institute of Technology, 1933; Ed.M. Tufts College, 1937; Associate Professor of Chemistry, Northeastern University.	
<i>Program Consultant for Chemistry</i>	
<b>Edward J. Booth</b>	Appointed 1956
A.B. Boston College, 1933; Ed.M. Boston College Graduate School, 1937; Associate Professor of Mathematics, Northeastern University.	
<i>Mathematics</i>	
<b>Kenneth E. Bourque</b>	Appointed 1959
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960; Senior Engineer, Edgerton, Germeshavsen & Grier.	
<i>Electrical Engineering Technology</i>	
<b>Robert B. Brack</b>	Appointed 1966
B.S.C.E. University of Massachusetts, 1960; M.Ed. Northeastern University, 1965; Instructor, Wentworth Institute; Sales Engineer, Barker Steel Co., Inc.	
<i>Civil Engineering Technology</i>	
<b>John P. Brady, Jr.</b>	Appointed 1958
S.B., M.S. Massachusetts Institute of Technology, 1953; P.E. (Mass.); Engineering Section Manager, Hewlett-Packard, Sanborn Div.	
<i>Electrical Engineering Technology</i>	
<b>Eugene G. Branca</b>	Appointed 1946
S.B. Massachusetts Institute of Technology, 1931; S.M. Massachusetts Institute of Technology, 1932; Head of Mathematics Department, Boston Latin School.	
<i>Mathematics</i>	

<b>Donald H. Breslow</b>	Appointed 1959
S.B. Brown University, 1954; M.S. Brown University, 1957; Staff Electrical Engineer, Itek Corporation.	
<i>Electrical Engineering Technology</i>	
<b>Karl L. Briggs</b>	Appointed 1957
B.S. Norwich University, 1924; M.A. Suffolk University, 1955; Head of Mathematics Department, Quincy High School.	
<i>Mathematics</i>	
<b>Donald C. Brock</b>	Appointed 1965
B.S. Bridgewater State College, 1959; M.S. Boston University, 1965; Mathematics Instructor, Needham High School.	
<i>Mathematics</i>	
<b>Bruno Brodfeld</b>	Appointed 1965
B.S.C.E. Institute of Civil Engineering, Bucharest, Rumania, 1951; P.E. (Mass.); Engineer, Hydraulics Division, Stone & Webster Engineering Corporation.	
<i>Civil Engineering Technology</i>	
<b>Curtis C. Brooks</b>	Appointed 1937
B.M.E. Northeastern University, 1924; A.M. Boston University, 1937; Retired.	
<i>Mathematics and Mechanical Engineering Technology</i>	
<b>Franklyn K. Brown</b>	Appointed 1955
Lowell Institute, 1939; B.S.Ed. Northeastern University, 1959; M.Ed. Northeastern University, 1963; Associate Professor, Graphic Science, Northeastern University.	
<i>Course Consultant for Production Drawing and Design</i>	
<b>William O. Bruehl</b>	Appointed 1956
B.S. University of Maryland, 1928; Ordnance Engineer, United States Army Ordnance Corps; Assistant Professor, Mechanical Engineering, Northeastern University.	
<i>Course Consultant for Mechanical Engineering Technology</i>	
<b>Ralph A. Buonopane</b>	Appointed 1964
B.S.Ch.E. Northeastern University, 1961; M.S.Ch.E. Northeastern University, 1963; Assistant Professor of Chemical Engineering, Northeastern University.	
<i>Chemistry</i>	
<b>Morris H. Burakoff</b>	Appointed 1957
B.S. University of Massachusetts, 1940; P.E. (Mass.); Department Chief, Western Electric Co.	
<i>Electrical Engineering Technology</i>	

<b>George E. Burdick</b>	Appointed 1950
A.B. Boston University, 1949; P.E. (Mass.); Consulting Engineer, Geo. Burdick Co.	
<i>Electrical Engineering Technology</i>	
<b>Richard C. Burrowes</b>	Appointed 1964
B.S. Swarthmore College, 1945; P.E. (Mass.); Data Processing Research Engineer, New England Electric System.	
<i>Electrical Engineering Technology</i>	
<b>Frederick J. Bush</b>	Appointed 1966
M.E. Stevens Institute of Technology, 1945; M.S. Stevens Institute of Technology, 1951; Senior Project Engineer, Polaroid Corporation.	
<i>Mathematics</i>	
<b>William D. Byard</b>	Appointed 1966
B.S. Suffolk University, 1954; M.S. Suffolk University, 1957; Graduate Study, Brandeis University, 1961; Experimental Biologist, Commonwealth of Massachusetts.	
<i>Medical Technology</i>	
<b>James A. Caffrey</b>	Appointed 1952
Ph.B. Boston College, 1922; M.Ed. Boston College, 1926; Instructor in Mathematics, Newman Preparatory School.	
<i>Mathematics</i>	
<b>Leroy M. Cahoon</b>	Appointed 1962
B.S. in C.E. Thayer School Dartmouth College, 1947; M.S. Northeastern University, 1956; P.E. (Mass.); Associate Professor of Civil Engineering, Northeastern University.	
<i>Program Consultant for Civil Engineering Technology</i>	
<b>Robert E. Cameron</b>	Appointed 1956
B.S. Northeastern University, 1951; P.E. (Mass.); R.L.S. (Mass.); General Manager, Harry R. Feldman, Inc. Engineers.	
<i>Civil Engineering Technology</i>	
<b>Frank R. Cangiano</b>	Appointed 1957
B.S. Boston University, 1957; Ed.M. Northeastern University, 1965; Instructor in Science and Mathematics, Hobbs Junior High School.	
<i>Mathematics</i>	
<b>Michael A. Cangiano</b>	Appointed 1946
S.B. Harvard University, 1933; Ed.M. Tufts College, 1949; Senior Sub-master, Medford High School.	
<i>Mathematics</i>	
<b>Alfred F. Carpenito</b>	Appointed 1965
B.S. Boston State College, 1953; A.M. Suffolk University, 1955; Ed.M. Northeastern University, 1965; Head of Department—Drafting, Boston Technical High School.	
<i>Engineering Graphics and Computation</i>	

<b>Dyer E. Carroll, Jr.</b>	Appointed 1966
S.B. Tufts University, 1966; Teaching Assistant, Northeastern University. <i>Mechanical Engineering Technology</i>	
<b>Richard I. Carter</b>	Appointed 1955
B.S. Northeastern University, 1952; M.S. Northeastern University, 1956; P.E. (Mass.); Associate Professor in Electrical Engineering and Director Computation Center, Northeastern University. <i>Engineering Graphics and Computation</i>	
<b>Walter J. Casey</b>	Appointed 1955
A.B. Boston College, 1951; M.Ed. Boston Teachers College, 1952; M.A.T. Brown University, 1964; Teacher, Boston Latin School. <i>Mathematics</i>	
<b>John H. Cashman</b>	Appointed 1966
B.S. Northeastern University, 1961; M.S. University of Detroit, 1963. <i>Mechanical Engineering Technology</i>	
<b>Walter J. Charow</b>	Appointed 1955
B.S.E.E. Worcester Polytechnic Institute, 1949; M.S.E.E. Worcester Poly- technic Institute, 1950; P.E. (Mass.); Technical Staff, The Mitre Corpora- tion. <i>Electrical Engineering Technology</i>	
<b>Bruce B. Claflin</b>	Appointed 1964
A.B. Harvard University, 1953; M.S. Northeastern University, 1958; As- sistant Professor of Mathematics, Northeastern University. <i>Course Consultant for Mathematics</i>	
<b>Philip J. Clang</b>	Appointed 1957
B.S. University of Connecticut, 1950; P.E. (Mass.); Principal Engineer, Jackson & Moreland, Division of United Engineers and Constructors Inc. <i>Mechanical Engineering Technology</i>	
<b>Laurence F. Cleveland</b>	Appointed 1931
B.S. Worcester Polytechnic Institute, 1929; M.S. Massachusetts Institute of Technology, 1935; P.E. (Mass.); Professor of Electrical Engineering, Northeastern University. <i>Program Consultant for Electrical Engineering Technology</i>	
<b>Thomas C. Coleman</b>	Appointed 1960
B.S.M.E. Tufts University, 1959; M.S.M.E. Northeastern University, 1961; Assistant Professor in Mechanical Engineering, Northeastern Uni- versity. <i>Course Consultant for Mechanical Engineering Technology</i>	
<b>Francis R. Collins</b>	Appointed 1963
B.S. Northeastern University, 1961; M.S. Northeastern University, 1963; Technical Staff, Advanced Planning for Communications, Mitre Corp. <i>Electrical Engineering Technology</i>	

<b>Joseph V. Connolly</b>	Appointed 1965
B.S. Boston College, 1952; M.Ed. State College at Boston, 1956; Teacher, Boston English High School.	
<i>Physics</i>	
<b>Jerome J. Connor, Jr.</b>	Appointed 1957
S.B. Massachusetts Institute of Technology, 1953; S.M. Massachusetts Institute of Technology, 1954; Sc.D. Massachusetts Institute of Technology, 1959; Associate Professor of Civil Engineering, Massachusetts Institute of Technology.	
<i>Mechanical Engineering Technology</i>	
<b>Roger T. Connor</b>	Appointed 1953
A.B. Boston College, 1952; M.Ed. State Teachers College, Boston, 1953; Head of Mathematics Department, Boston Technical High School.	
<i>Mathematics</i>	
<b>Robert J. Connors</b>	Appointed 1947
B.S. Northeastern University, 1948; Manager of Technology, Electronic Systems, Sylvania Electric Products, Inc.	
<i>Electrical Engineering Technology</i>	
<b>Edward M. Cook</b>	Appointed 1941
A.B. Harvard College, 1935; A.M. Boston University, 1947; Professor of Mathematics, Northeastern University.	
<i>Program Consultant for Mathematics</i>	
<b>Maureen P. Cooney</b>	Appointed 1965
S.B. Boston College, 1962; Instructor of Mathematics, Quincy High School.	
<i>Mathematics</i>	
<b>Thomas J. Crowley</b>	Appointed 1966
S.B. Northeastern University, 1958; M.S. Northeastern University, 1962; Research Associate, Harvard University School of Public Health.	
<i>Mechanical Engineering Technology</i>	
<b>Dominic J. Cucinotti</b>	Appointed 1966
B.S. Northeastern University, 1955; M.S. Northeastern University, 1965; Engineer, Stone & Webster Engineering Corporation.	
<i>Engineering Graphics and Computation</i>	
<b>Herbert R. Davenport</b>	Appointed 1948
B.S. Northeastern University, 1937; Quality Control Engineer, General Radio Co.	
<i>Electrical Engineering Technology</i>	
<b>Warren C. Dean</b>	Appointed 1941
A.B. Boston University, 1931; M.A. Boston University, 1940; Associate Professor of Mathematics, Northeastern University.	
<i>Course Consultant for Mathematics</i>	

<b>Thomas R. Deveney</b>	Appointed 1965
B.S. Boston College, 1961; Instructor in Mathematics, Boston Latin School.	
<i>Mathematics</i>	
<b>Peter C. DiCarlo</b>	Appointed 1963
B.S.M.E. Northeastern University, 1961; M.S.M.E. Northeastern University, 1963; Senior Aerospace Research Engineer, Avco Space Systems Division.	
<i>Mechanical Engineering Technology</i>	
<b>Giles C. Dilg</b>	Appointed 1966
B.S.E.E. Syracuse University, 1958; M.S.E.E. Northeastern University, 1964; Senior Research Engineer, Avco Everett Research Laboratory.	
<i>Engineering Graphics and Computation</i>	
<b>Francis J. DiSabatino</b>	Appointed 1965
B.S. Tufts University, 1949; Ed.M. Tufts University, 1950; Science Department Chairman, Norwell School Department.	
<i>Chemistry</i>	
<b>William V. Durante</b>	Appointed 1964
B.S. Boston College, 1951; M.Ed. Boston State College, 1952; Head of Mathematics Department, Brighton High School.	
<i>Mathematics</i>	
<b>Henry B. Eden</b>	Appointed 1957
School of the Museum of Fine Arts, 1951; Art Director, Vice-President, Anco Technical Services, Inc.	
<i>Engineering Graphics and Computation</i>	
<b>Herbert E. Engel</b>	Appointed 1958
B.S. College of the City of New York, 1949; M.S. Northeastern University, 1961; Senior System Analyst, Dynamics Research Corporation.	
<i>Electrical Engineering Technology</i>	
<b>Charles P. Engelhardt, Jr.</b>	Appointed 1942
B.S. Harvard University, 1928; Master of Architecture, Harvard University, 1930; Architect, Kilham, Hopkins, Greeley & Brodie.	
<i>Engineering Graphics and Computation</i>	
<b>Adolf J. Erikson</b>	Appointed 1966
B.B.A. Northeastern University, 1950; M.B.A. Northeastern University, 1966; P.E. (Mass.); Leader, Engineering, R.C.A. Memory Prod. Oper.	
<i>Engineering Graphics and Computation</i>	
<b>John T. Farrington</b>	Appointed 1966
B.S. Rhode Island College, 1962; Ed.M. Northeastern University, 1966; Asst. Supt. of Schools, Easton, Mass.	
<i>Engineering Graphics and Computation</i>	

<b>Martin J. Feeney</b>	Appointed 1957
B.S. Massachusetts Institute of Technology, 1931; Ed.M. Boston State Teachers College, 1938; Principal, Henry Grew District, Boston Public Schools.	
<i>Mathematics</i>	
<b>Warren G. Ferzoco</b>	Appointed 1966
A.E. Lincoln Institute, 1960; B.B.A. Northeastern University, 1963; M.Ed. State College at Boston, 1966; Instructor, Rindge Technical School.	
<i>Engineering Graphics and Computation</i>	
<b>William D. Finan</b>	Appointed 1946
A.B. Boston College, 1938; M.A. Columbia University, 1941; Reading Clinician, Division of Pupil Personnel Services, Newton Public Schools.	
<i>Mathematics</i>	
<b>Louis A. Fiore</b>	Appointed 1956
A.E. Lincoln Technical Institute, 1944; B.B.A. Northeastern University, 1946; Mechanical Engineer, Design Checker, American Science and Engineering, Inc.	
<i>Engineering Graphics and Computation</i>	
<b>Brian P. Fitzgerald</b>	Appointed 1966
B.E.E. Manhattan College, 1957; M.S.E.E. Northeastern University, 1965; Advanced Research Engineer, Applied Research Laboratory, Sylvania Electric Products, Inc.	
<i>Electrical Engineering Technology</i>	
<b>Robert F. Ford</b>	Appointed 1962
B.S.E.E. Northeastern University, 1961; M.S.E.E. Northeastern University, 1963; Applications Engineer, Instrument Associates.	
<i>Electrical Engineering Technology</i>	
<b>Eugene G. Fortin</b>	Appointed 1958
B.A. St. Anselm's College, 1954; Engineer, Radio Corporation of America.	
<i>Chemistry</i>	
<b>Earlwood T. Fortini</b>	Appointed 1957
Lowell Institute School, 1947; A.B. Harvard University, 1963; P.E. (Mass.); Staff Engineer, Compugraphic Corp.	
<i>Mechanical Engineering Technology</i>	
<b>John L. Freedman</b>	Appointed 1949
S.B. Massachusetts Institute of Technology, 1932; P.E. (Mass.); Senior Project Engineer, American Science & Engineering, Inc.	
<i>Course Consultant for Electrical Engineering Technology</i>	
<b>Jerry M. Galatis</b>	Appointed 1965
B.S. Northeastern University, 1948; M.Ed. Northeastern University, 1962; Nuclear Research, Controls for Radiation.	
<i>Physics</i>	

<b>Donald V. Gearan</b>	Appointed 1965
B.S. Fitchburg State College, 1952; M.Ed. Fitchburg State College, 1959; Teacher of Engineering Drawing, Weston High School. <i>Engineering Graphics and Computation</i>	
<b>Bronislaus J. Gedrewicz</b>	Appointed 1956
B.S. Massachusetts Institute of Technology, 1931; Senior Designer, Lynn Flight Propulsion Division, General Electric Company. <i>Engineering Graphics and Computation</i>	
<b>Peter D. Gianino</b>	Appointed 1965
B.S. Boston College, 1953; M.S. Northeastern University, 1959; Research Physicist, Air Force Cambridge Research Laboratories. <i>Physics</i>	
<b>Ernest I. Glickman</b>	Appointed 1966
B.A. Ohio Wesleyan University, 1962; M.S. Massachusetts Institute of Technology, 1964; Management Analysis Officer, First Lieutenant, United States Air Force, L. G. Hanscom Field. <i>Mathematics</i>	
<b>William B. Goggins, Jr.</b>	Appointed 1965
B.S. U.S. Naval Academy, 1957; M.S.E.E. Air Force Institute of Tech- nology, 1962; P.E. (Ohio); Research Engineer, Air Force Cambridge Re- search Laboratories. <i>Electrical Engineering Technology</i>	
<b>David S. Goldman</b>	Appointed 1966
B.S. Polytechnic Institute of Brooklyn, 1961; M.S. Northeastern Uni- versity, 1966; Project Engineer, Raytheon Company. <i>Electrical Engineering Technology</i>	
<b>Karen E. Griffin</b>	Appointed 1966
B.A. Northeastern University, 1966; MT (ASCP) Northeastern University; Medical Technologist, Newton-Wellesley Hospital. <i>Medical Technology</i>	
<b>Arthur F. Gustus</b>	Appointed 1963
B.S. Boston State College, 1953; M.Ed. Boston State College, 1956; Supervisor of Science, Boston Public Schools. <i>Physics</i>	
<b>Joseph L. Hallett, Jr.</b>	Appointed 1958
S.B. Northeastern University, 1955; Section Head, Sylvania Electric Products. <i>Electrical Engineering Technology</i>	

<b>Frank A. Hamilton</b>	Appointed 1947
A.E. Lincoln Technical Institute, 1939; Structural Engineer, Jackson & Moreland.	
<i>Civil Engineering Technology</i>	
<b>Alden G. Handy</b>	Appointed 1957
B.S. Boston University, 1924; M.A. Boston University, 1936; Consultant, Optics.	
<i>Physics</i>	
<b>Francis R. Hankard</b>	Appointed 1946
S.B. Northeastern University, 1946; M.A. Boston University, 1949; Chemist, State Police Laboratories.	
<i>Physics</i>	
<b>George C. Harrison</b>	Appointed 1963
B.S. Northeastern University, 1961; M.S. Northeastern University, 1963; Electronic Circuits Design Engineer, Radio Corporation of America.	
<i>Electrical Engineering Technology</i>	
<b>Lewis H. Holzman</b>	Appointed 1966
B.S.C.E. Lehigh University, 1951; S.M.C.E. Massachusetts Institute of Technology, 1958; P.E. (Mass.); Manager of Data Processing, Chas. T. Main, Inc.	
<i>Engineering Graphics and Computation</i>	
<b>Arthur F. Howe</b>	Appointed 1965
B.S. Massachusetts State College, 1940; M.S. University of New Hampshire, 1942; Ph.D. Yale University, 1953; Immunochemist, Retina Foundation.	
<i>Chemistry</i>	
<b>Everett L. Hume</b>	Appointed 1950
B.S. 1933, M.S. 1933, Massachusetts Institute of Technology; P.E. (Mass.); Staff, Instrumentation Laboratory, Massachusetts Institute of Technology.	
<i>Civil Engineering Technology</i>	
<b>Mervyn Israel</b>	Appointed 1964
B.S. Brooklyn College, 1955; M.S. University of Pennsylvania, 1956; Ph.D. University of Pennsylvania, 1959; Research Associate, Children's Cancer Research Foundation, The Children's Hospital Medical Center, Department of Biological Chemistry, Harvard Medical School.	
<i>Chemistry</i>	
<b>Perry G. Jameson</b>	Appointed 1965
B.S. Bates College, 1941; M.Ed. Boston State College, 1965; Instructor of Mathematics, Boston Latin School.	
<i>Mathematics</i>	

<b>Eugene F. Joyce</b> U.S. Army, Retired; Electronics Technician, Northeastern University. <i>Electrical Engineering Technology</i>	Appointed 1963
<b>Edward Kaplan</b> B.S. Tufts University, 1948; P.E. (Mass.); Executive Assistant, New England Electric System. <i>Engineering Graphics and Computation</i>	Appointed 1966
<b>Britta L. Karlsson</b> M.T. (A.S.C.P.) Faulkner Hospital, 1957; B.S. Northeastern University, 1959; Instructor, Biology Department, Northeastern University. <i>Course Consultant for Medical Technology</i>	Appointed 1965
<b>A. Louis Karp</b> A.B. Harvard College, 1927; Ed.M. Boston University, 1931; Principal, Boston School Department. <i>Mathematics</i>	Appointed 1956
<b>Leon Katler</b> Lowell Institute, 1949; Graduate Study, Northeastern University, 1952–1955; P.E. (Mass.); Structural Engineer, Stone & Webster Engineering Corporation. <i>Civil Engineering Technology</i>	Appointed 1963
<b>Louis Katona</b> B.C.E. College of the City of New York, 1944; M.C.E. Polytechnic Institute of Brooklyn, 1948; P.E. (Mass. and N.Y.); Hydraulic and Sanitary Engineer, The Badger Co. <i>Civil Engineering Technology</i>	Appointed 1959
<b>Charles W. Kaufman</b> B.S. in Ed. Bridgewater Teachers College, 1939; Ed.M. Boston University, 1940; M.N.S. Worcester Polytechnic Institute, 1960; Guidance Counselor, Boston Latin School. <i>Physics</i>	Appointed 1958
<b>John T. Keiran</b> A.B. Boston College, 1933; A.M. Harvard University, 1935; Master, Boston Latin School. <i>Mathematics</i>	Appointed 1957
<b>George F. Kent</b> B.S. Northeastern University, 1962; M.S. Northeastern University, 1964; Staff Engineer, Dynatech Corporation. <i>Mechanical Engineering Technology</i>	Appointed 1966

<b>Nicholas P. Kernweis</b>	Appointed 1957
B.E.E. Polytechnic Institute of Brooklyn, 1952; M.S. Northeastern University, 1957; Research Physicist, Air Force Cambridge Research Laboratory.	
<i>Course Consultant for Electrical Engineering Technology</i>	
<b>Bernard J. Kiley</b>	Appointed 1958
B.E. 1953, M.E. 1954, Yale University; P.E. (Mass.); Senior Engineer, Jackson & Moreland, Div., United Engineers & Constructors, Inc.	
<i>Mechanical Engineering Technology</i>	
<b>Mark M. Kiley</b>	Appointed 1955
B.E. Yale University, 1948; M.E. Yale University, 1949; P.E. (Mass., R.I., La.); Consulting Engineer.	
<i>Mechanical Engineering Technology</i>	
<b>Je Chul Kim</b>	Appointed 1966
B.S. Massachusetts Institute of Technology, 1964.	
<i>Mechanical Engineering Technology</i>	
<b>William F. King, III</b>	Appointed 1965
B.S.E.E. University of Florida, 1963; M.S. Stanford University, 1964; Research Scientist, Air Force Cambridge Research Laboratories.	
<i>Mathematics</i>	
<b>Philip D. Kingman</b>	Appointed 1964
B.S.C.E. Norwich University, 1953; LL.B. Portia Law School, 1963; Member Massachusetts Bar, 1964; P.E. (Mass.); R.L.S. (Mass.); Supervising Engineer, Boston Edison Co.	
<i>Civil Engineering Technology</i>	
<b>John J. Klein</b>	Appointed 1950
B.S. Northeastern University, 1949; M.S. Northeastern University, 1955; Leader (Advanced Circuit Development), Aerospace Systems Division, Radio Corporation of America.	
<i>Electrical Engineering Technology</i>	
<b>John P. Kopecki</b>	Appointed 1966
B.S. Northeastern University, 1965; Instructor, Northeastern University.	
<i>Engineering Graphics and Computation</i>	
<b>Juris Krumins</b>	Appointed 1966
B.S. Rutgers University, 1966; Teaching Assistant, Northeastern University.	
<i>Mechanical Engineering Technology</i>	

<b>David H. Laananen</b>	Appointed 1966
B.S. Worcester Polytechnic Institute, 1964; M.S. Northeastern University, 1965; NSF Trainee, Northeastern University.	
<i>Mechanical Engineering Technology</i>	
<b>Horatio W. Lamson</b>	Appointed 1945
B.S. Massachusetts Institute of Technology, 1915; M.A. Harvard University, 1917; P.E. (Mass.); Research Engineer, Emeritus, General Radio Company.	
<i>Electrical Engineering Technology</i>	
<b>Herbert C. Lang</b>	Appointed 1936
B.S. Northeastern University, 1934; P.E. (Mass.); Director of Training, Mason-Neilan Division of Worthington Controls Co.	
<i>Program Consultant for Engineering Graphics and Computation</i>	
<b>Robert S. Lang</b>	Appointed 1955
B.S. Northeastern University, 1945; Ed.M. Boston University, 1954; Associate Professor of Graphic Science, Northeastern University.	
<i>Program Consultant Engineering Graphics and Computation</i>	
<b>Aristotle T. Laskaris</b>	Appointed 1960
A.B. Boston University, 1954; M.S. Northeastern University, 1956; Group Leader, Avco Corp.	
<i>Chemistry</i>	
<b>Clarence E. LeBell</b>	Appointed 1955
Lowell Institute, 1940; P.E. (Mass.); Mechanical and Electrical Engineering Senior Designer, Aircraft Gas Turbine Division, General Electric Co.	
<i>Engineering Graphics and Computation</i>	
<b>Alvin J. Lesieur</b>	Appointed 1965
B.S. Central Connecticut State College, 1961; M.S. Northeastern University, 1966; Instructor, Braintree High School.	
<i>Engineering Graphics and Computation</i>	
<b>Howard Lessoff</b>	Appointed 1957
B.S. Northeastern University, 1953; M.S. Northeastern University, 1957; Staff Member, National Aeronautics and Space Administration.	
<i>Chemistry</i>	
<b>Demetre P. Ligor</b>	Appointed 1959
B.S.E.E. Massachusetts Institute of Technology, 1949; P.E. (Mass.); Vice-President, Applied Measurements, Inc.	
<i>Physics</i>	
<b>James W. Linehan</b>	Appointed 1966
B.S.Ch.E. Northeastern University, 1966; Graduate Fellow, Northeastern University.	
<i>Chemistry</i>	

<b>Andrew G. Lofgren</b>	Appointed 1946
Lowell Institute, 1932; A.A. Harvard University, 1942; Ed.M. Boston University, 1946; P.E. (Mass.); Staff Appointment, Instrumentation Laboratory, Massachusetts Institute of Technology.	
<i>Engineering Graphics and Computation</i>	
<b>Roger G. Long</b>	Appointed 1952
A.E. Lincoln Technical Institute, 1950; Graduate Study, Harvard University, 1950-51; B.B.A. Northeastern University, 1953; P.E. (Mass.); Senior Engineering Specialist, Sylvania Electric Products.	
<i>Electrical Engineering Technology</i>	
<b>Kenneth A. Lucas</b>	Appointed 1950
S.B. Massachusetts Institute of Technology, 1925; M.Ed. Boston University, 1931; P.E. (Mass.); R.L.S. (Mass.); Chief of Survey, Whitman & Howard, Inc.	
<i>Civil Engineering Technology</i>	
<b>John F. Lutkevich</b>	Appointed 1956
A.E. Lincoln Technical Institute, 1952; B.B.A. Northeastern University, 1954; Senior Engineer, Sylvania Electric Products, Inc.	
<i>Engineering Graphics and Computation</i>	
<b>Andrew C. MacAulay, Jr.</b>	Appointed 1960
B.S. Northeastern University, 1953; M.S. Northeastern University, 1957; Director Core Laboratory, New England Medical Center.	
<i>Chemistry</i>	
<b>Alvin Mandell</b>	Appointed 1950
B.E.E. College of the City of New York, 1943; M.S.E.E. Northeastern University, 1955; P.E. (Mass.); Senior Project Engineer, Raytheon Space & Information Systems Division.	
<i>Electrical Engineering Technology</i>	
<b>Jack I. Mann</b>	Appointed 1960
B.S.C.E. Munich Polytech, 1951; M.S. Northeastern University, 1959; P.E. (Mass., Vermont); Senior Engineer, Jackson & Moreland, Engineers.	
<i>Mechanical Engineering Technology</i>	
<b>Francis T. McCabe</b>	Appointed 1952
B.S. University of Maine, 1917; Ed.M. Harvard University, 1928; Retired.	
<i>Engineering Graphics and Computation</i>	
<b>Edward F. McCarren, Jr.</b>	Appointed 1951
A.E. Lincoln Technical Institute, 1951; Engineer, Baldwin-Lima-Hamilton Corp.	
<i>Electrical Engineering Technology</i>	

<b>Vernon S. McFarlin</b>	Appointed 1953
B.E.E. Northeastern University, 1931; P.E. (Mass.); Supervising Engineer, Boston Edison Company.	
<i>Mathematics</i>	
<b>Eugene L. McLaughlin</b>	Appointed 1956
A.B. Boston College, 1929; M.A. Boston College Graduate School, 1931; Head of Mathematics Department, Hyde Park High School.	
<i>Mathematics</i>	
<b>Carl J. Mellea</b>	Appointed 1960
S.B. Northeastern University, 1949; M.S. Northeastern University, 1960; P.E. (Mass., R.I., Maine, Vt., N.H.); Structural Engineer, Howard, Needles, Tammen & Bergendoff.	
<i>Civil Engineering Technology</i>	
<b>Walter Messcher</b>	Appointed 1966
B.M.E. City College of New York 1963; M.S. Northeastern University, 1965; Instructor, Northeastern University.	
<i>Course Coordinator, Engineering Graphics and Computation</i>	
<b>Carl Miller</b>	Appointed 1945
A.B. Harvard University, 1929; LL.B. Boston University, 1933; Ed.M. Boston Teachers College, 1935; Assistant Principal, Boston School Department.	
<i>Course Consultant for Mathematics</i>	
<b>Richard W. Miller</b>	Appointed 1959
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960; P.E. (Mass.); Supervisor, Engineering Flow Group, Foxboro Co.	
<i>Mechanical Engineering Technology</i>	
<b>Ernest E. Mills</b>	Appointed 1947
B.S. Northeastern University, 1946; M.S. Northeastern University, 1954; P.E. (Mass.); Associate Professor of Mechanical Engineering, Northeastern University.	
<i>Program Consultant for Mechanical Engineering Technology</i>	
<b>Theodore J. Morin, Jr.</b>	Appointed 1961
S.B. Northeastern University, 1959; M.A. College of William and Mary, 1961; Research Associate in Mechanical Engineering, Northeastern University.	
<i>Course Consultant for Physics</i>	
<b>John K. Moulton</b>	Appointed 1965
A.B. Harvard College, 1936; Ed.M. Harvard University, 1940; A.M. Bowdoin College, 1962; Mathematics Teacher, Brookline High School.	
<i>Mathematics</i>	

<b>George Moy</b>	Appointed 1965
B.S. Northeastern University, 1962; M.S. Northeastern University, 1964; Staff Engineer, Dynatech Corporation.	
<i>Mechanical Engineering Technology</i>	
<b>H. Leslie Mumford</b>	Appointed 1966
B.S.Ed. Bridgewater State College, 1963; Teacher, Norwell High School. <i>Chemistry</i>	
<b>Richard C. Murphy</b>	Appointed 1965
B.S. State College at Boston, 1965; Physics Teacher, Boston English High School. <i>Physics</i>	
<b>Robert L. Murray</b>	Appointed 1965
A.B. Boston College, 1950; M.Ed. Boston State College, 1951; Head of Mathematics Department, Boston English High School. <i>Mathematics</i>	
<b>Julian S. Natanson</b>	Appointed 1957
Certificate, Franklin Technical Institute, 1941; Certificate, Lowell Insti- tute School, 1943; P.E. (Mass.); Manager of Engineering, Bellofram Corporation. <i>Engineering Graphics and Computation</i>	
<b>Donald G. Nelson</b>	Appointed 1966
B.S.E. Fitchburg State College, 1961; M.S. Northeastern University, 1966; Instructor, Braintree High School. <i>Engineering Graphics and Computation</i>	
<b>Marc N. Nezar</b>	Appointed 1966
Sc.B. Brown University, 1963; Development Engineer, Western Electric Company. <i>Engineering Graphics and Computation</i>	
<b>Sander E. Nydick</b>	Appointed 1966
B.S.M.E. Newark College of Engineering, 1959; M.S.M.E. Northeastern University, 1965; Scientist, Space Sciences, Inc. <i>Civil Engineering Technology</i>	
<b>John R. O'Brien</b>	Appointed 1946
A.B. Boston College, 1933; A.M. Boston College, 1934; Assistant Head Master, Brighton High School. <i>Mathematics</i>	
<b>John C. O'Callahan</b>	Appointed 1961
B.S. Northeastern University, 1961; M.S. Northeastern University, 1963: Instructor in Mechanical Engineering, Northeastern University. <i>Mechanical Engineering Technology</i>	

<b>Carl A. Olson, Jr.</b>	Appointed 1964
Lowell Institute, 1938; B.S. Fitchburg State College, 1947; Ed.M. Boston University, 1951; Department Head, Wellesley High School. <i>Engineering Graphics and Computation</i>	
<b>Thomas J. Owens</b>	Appointed 1952
A.B. Boston College, 1943; M.Ed. Boston College, 1961; Instructor in Mathematics, Quincy High School. <i>Mathematics</i>	
<b>Charles A. Packard</b>	Appointed 1965
B.S. Fitchburg State College, 1935; M.E. Boston University, 1939; Ed.M. Northeastern University, 1965; Drafting Instructor, Boston Technical High School. <i>Engineering Graphics and Computation</i>	
<b>James A. Palmer</b>	Appointed 1961
Electronic Technician, Northeastern University. <i>Electrical Engineering Technology</i>	
<b>Burton S. Parker</b>	Appointed 1963
B.S. Northeastern University, 1944; P.E. (Mass.); Mechanical Engineer, U.S. Army Materials Research Agency. <i>Mechanical Engineering Technology</i>	
<b>William M. Parker</b>	Appointed 1957
LL.B. Northeastern University, 1925; A.E. Lincoln Institute, 1956; Engineering Section Administrator, Northrop-Nortronics P.P.D. <i>Mathematics</i>	
<b>William H. Parmenter</b>	Appointed 1952
A.E. Lincoln Technical Institute, 1948; B.B.A. Northeastern University, 1952; Instructor, Newton Technical High School. <i>Electrical Engineering Technology</i>	
<b>Donald Paterson</b>	Appointed 1959
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960; Senior Engineer, Missile & Space Division, Raytheon Company. <i>Mechanical Engineering Technology</i>	
<b>Dominic A. Piccione</b>	Appointed 1966
B.S. Northeastern University, 1958; M.S. Northeastern University, 1960; Chief, Test Engineering Section, Avco Corporation Space Systems Division. <i>Mechanical Engineering Technology</i>	
<b>Norman C. Poirier</b>	Appointed 1966
B.S. Northeastern University, 1963; M.S. Northeastern University, 1965; Research Associate, Northeastern University. <i>Electrical Engineering Technology</i>	

<b>Peter D. Prevett</b>	Appointed 1964
B.S. Physics, Tulane University, 1958; B.S.E.E. Tulane University, 1960; M.S.E.E. Northeastern University, 1964; Instructor in Electrical Engineering, Northeastern University.	
<i>Electrical Engineering Technology</i>	
<b>Charles H. Price, Jr.</b>	Appointed 1960
B.S. Northeastern University, 1955; M.S. Northeastern University, 1960; Senior Engineer, Itek Corporation.	
<i>Electrical Engineering Technology</i>	
<b>Sidney F. Quint</b>	Appointed 1954
S.B. Northeastern University, 1946; S.M. Massachusetts Institute of Technology, 1950; P.E. (Mass.); Systems Engineer, Raytheon Company.	
<i>Electrical Engineering Technology</i>	
<b>Gerard H. Ratcliffe</b>	Appointed 1955
A.B. Boston University, 1949; Research Engineer, Sylvania Electric Products, Inc.	
<i>Electrical Engineering Technology</i>	
<b>Bernard C. Reddy</b>	Appointed 1965
B.S. State College at Boston, 1961; M.Ed. State College at Boston, 1965; Teacher of Science, Brighton High School.	
<i>Physics</i>	
<b>Edward L. Rich</b>	Appointed 1956
B.S. Northeastern University, 1952; M.S. Northeastern University, 1956; P.E. (Mass.); Manager, Sylvania Electric Products, Inc.	
<i>Mechanical Engineering Technology</i>	
<b>William Richmond</b>	Appointed 1964
B.S. Boston College, 1937; Ed.M. Harvard University, 1956; Physics Instructor, Everett High School.	
<i>Mathematics</i>	
<b>Nathan W. Riser</b>	Appointed 1964
A.B. University of Illinois, 1941; A.M. Stanford University, 1947; Ph.D. Stanford University, 1949; Chairman, Biology Department, Northeastern University.	
<i>Program Consultant for Biology</i>	
<b>Walter H. Rowell, Jr.</b>	Appointed 1964
B.S. Northeastern University, 1958; P.E. (Mass., Vermont); Senior Electrical Engineer, Jackson & Moreland Division of United Engineers & Constructors, Inc.	
<i>Electrical Engineering Technology</i>	

<b>Wilfred P. Rule</b>	Appointed 1957
B.S. Tufts University, 1953; M.S. Massachusetts Institute of Technology, 1956; P.E. (Mass.); Chairman, Graphic Science Department, Northeastern University.	
<i>Engineering Graphics and Computation</i>	
<b>Leo D. Salvucci</b>	Appointed 1965
A.B. Boston College, 1951; M.Ed. Boston College, 1958; Teacher of Mathematics, Boston Latin School.	
<i>Mathematics</i>	
<b>Costa Samar</b>	Appointed 1965
B.S. Boston University, 1956; M.S.T. University of Arizona, 1966; Mathematics Teacher, Needham High School.	
<i>Mathematics</i>	
<b>Richard L. Savage</b>	Appointed 1955
B.S. University of Maine, 1950; M.S. Northeastern University, 1955; P.E. (Mass.); Associate Professor of Civil Engineering, Tufts University; Consulting Engineer.	
<i>Mechanical Engineering Technology</i>	
<b>Henry Schwartz</b>	Appointed 1958
A.B. University of California, 1939; M.Ed. State College, North Adams, 1944; P.E. (Mass.); Field Engineer.	
<i>Physics</i>	
<b>Robert T. Schwartz</b>	Appointed 1966
B.S. Massachusetts Institute of Technology, 1958; M.S. Northeastern University, 1962; P.E. (Mass.); Staff Engineer, Raytheon Company.	
<i>Electrical Engineering Technology</i>	
<b>Myron R. Segelman</b>	Appointed 1966
B.S. Mass. College of Pharmacy, 1954; M.S. Mass. College of Pharmacy, 1956; Assistant Professor, Department of Biology, State College at Boston.	
<i>Medical Technology</i>	
<b>Ralph W. Sexton</b>	Appointed 1966
B.S. Northeastern University, 1949; M.S. Northeastern University, 1955; P.E. (Mass., N.H.); Assistant Professor of Mechanical Engineering, Northeastern University.	
<i>Mechanical Engineering Technology</i>	
<b>Harold M. Sharaf</b>	Appointed 1955
B.S., M.S. Massachusetts Institute of Technology, 1952; President, Tenco Electronics, Inc.	
<i>Electrical Engineering Technology</i>	

<b>William M. Sherry</b>	Appointed 1962
B.S. Boston College, 1955; M.S. University of New Hampshire, 1957; Research Physicist, Avco Corp.	
<i>Physics</i>	
<b>Walter S. Shields</b>	Appointed 1966
B.S. Boston College, 1961; Ed.M. State College at Boston, 1966; Instructor, Needham Public Schools.	
<i>Mathematics</i>	
<b>Gordon Smith</b>	Appointed 1957
B.S. Massachusetts Institute of Technology, 1954; P.E. (R.I.); Engineering Manager, Fenwal, Inc.	
<i>Electrical Engineering Technology</i>	
<b>Frank E. South</b>	Appointed 1965
B.S.E.E. Worcester Polytechnic Institute, 1932; Administrative Manager, Worthington Controls Co.	
<i>Engineering Graphics and Computation</i>	
<b>Sherman P. Spaulding</b>	Appointed 1966
B.S. Harvard College, 1944; M.A. Boston University, 1950; Instructor, Lincoln-Sudbury Regional High School.	
<i>Engineering Graphics and Computation</i>	
<b>Elliot Spector</b>	Appointed 1966
B.S. New England College of Pharmacy, 1953; Ph.D. University of Wisconsin, 1957; Professor of Biochemistry, Northeastern University.	
<i>Medical Technology</i>	
<b>S. Leonard Spitz</b>	Appointed 1955
B.S. Northeastern University, 1946; P.E. (Mass.); Staff Engineer, Itek Corporation.	
<i>Mechanical Engineering Technology</i>	
<b>Benjamin A. Stahl</b>	Appointed 1966
A.B. Eastern Nazarene College, 1950; Senior Engineer—Research, Raytheon Company.	
<i>Engineering Graphics and Computation</i>	
<b>Joseph E. Steffano</b>	Appointed 1965
B.S. Northeastern University, 1959; M.S. Northeastern University, 1964; P.E. (Mass.); General Manager, Yunits Engineering Co.	
<i>Civil Engineering Technology</i>	
<b>Robert B. Stitt</b>	Appointed 1959
B.B.A. Northeastern University, 1959; M.B.A. Northeastern University, 1966; Product Manager, Edgerton, Germeshausen & Grier, Inc.	
<i>Electrical Engineering Technology</i>	

<b>Elwood M. Stoddard</b>	Appointed 1964
B.S. Boston University, 1941; Ed.M. Boston University, 1950; Former Head of Mathematics Department, Hingham Public School. (Retired 1965.)	
<i>Mathematics</i>	
<b>Raimundas Sukys</b>	Appointed 1962
B.S. Northeastern University, 1958; M.S. Northeastern University, 1961; Research Associate in Electrical Engineering, Northeastern University.	
<i>Electrical Engineering Technology</i>	
<b>David M. Sumner</b>	Appointed 1966
B.S. Northeastern University, 1962; Instructor, King Philip Regional High School.	
<i>Engineering Graphics and Computation</i>	
<b>John L. Swanson</b>	Appointed 1966
B.S.M.E. Northeastern University, 1966.	
<i>Mechanical Engineering Technology</i>	
<b>Jason R. Taylor</b>	Appointed 1966
B.S. Massachusetts Institute of Technology, 1958; M.S. Northeastern University, 1963; Staff Scientist, Avco Corporation.	
<i>Mathematics</i>	
<b>Maurice Temple</b>	Appointed 1956
B.S. Northeastern University, 1947; M.Ed. Boston State College, 1952; M.S. Simmons College, 1965; Associate Professor of Physical Science, Boston State College.	
<i>Mathematics</i>	
<b>Robert L. Thing</b>	Appointed 1957
B.S. 1943, M.S. 1951, University of Illinois; Development Engineer, Worthington Controls Company.	
<i>Electrical Engineering Technology</i>	
<b>Phineas Tobe</b>	Appointed 1960
A.B. Harvard College, 1932; Ed.M. Boston Teachers College, 1935; Head of Science Department, Girls' Latin School.	
<i>Physics</i>	
<b>John S. Travia</b>	Appointed 1965
B.S. Northeastern University, 1958; M.S. Northeastern University, 1964; P.E. (Mass.); Senior Engineer, Raytheon Co.	
<i>Electrical Engineering Technology</i>	
<b>J. Derek Van Wyk</b>	Appointed 1966
B.S. United States Military Academy, 1953; Staff Engineer, Avco Corporation.	
<i>Engineering Graphics and Computation</i>	

<b>Arthur M. Vuilleumier</b>	Appointed 1953
Head of Electronics Department, Blue Hills Regional Vocational Technical High School.	
<i>Electrical Engineering Technology</i>	
<b>Richard Wadler</b>	Appointed 1953
A.E. Lincoln Technical Institute, 1947; P.E. (Mass.); Senior Mechanical Engineer, Raytheon Co., Missile and Space Division.	
<i>Mechanical Engineering Technology</i>	
<b>Thomas H. Wallace</b>	Appointed 1941
S.B. Boston University, 1933; M.A. Harvard Graduate School, 1936; Ph.D. Boston University, 1939; Professor of Physics, Northeastern University.	
<i>Program Consultant for Physics</i>	
<b>David S. Walsh</b>	Appointed 1966
A.E. Wentworth Institute, 1959; B.S. Northeastern University, 1962; Training Director, Draper Corporation.	
<i>Engineering Graphics and Computation</i>	
<b>John E. Walsh</b>	Appointed 1947
A.B. St. Michael's College, 1938; A.M. Boston University, 1940; Staff Consultant, Bedford Laboratory, Raytheon Company.	
<i>Mathematics</i>	
<b>Frank S. Weinert</b>	Appointed 1957
A.B. Harvard College, 1948; B.S. Columbia University, 1951; M.S. Columbia University, 1952; Optometrist; Chairman of Mathematics Department, Dana Hall School.	
<i>Mathematics</i>	
<b>Morton D. Weinert</b>	Appointed 1955
A.B. Harvard University, 1938; Ed.M. Boston Teachers College, 1939; M.Ed. Harvard University, 1963; Head of the Mathematics Department, Boston Latin School.	
<i>Mathematics</i>	
<b>George B. Welch</b>	Appointed 1946
B.S. Bowdoin College, 1922; Ph.D. Cornell University, 1928; Professor Emeritus of Physics, Northeastern University.	
<i>Course Consultant for Physics</i>	
<b>Ralph A. Wellings</b>	Appointed 1955
B.S. Boston College, 1955; M.Ed. State College at Boston, 1960; Mathematics Instructor, Boston Public Schools.	
<i>Mathematics</i>	

<b>Ralph E. Wellings</b>	Appointed 1944
A.B. Boston College, 1920; A.M. Boston College, 1925; Ed.M. Boston Teachers College, 1930; Head of Science Department, Brighton High School.	
<i>Physics</i>	
<b>Thomas F. White</b>	Appointed 1957
B.S. Mathematics, Boston College, 1951; B.S.M.E.E. Massachusetts Maritime Academy, 1952; M.Ed. Bridgewater State Teachers College, 1952; M.A. Boston College, 1965; Mathematics Instructor, Quincy High School.	
<i>Mathematics</i>	
<b>Willard B. Whittemore</b>	Appointed 1957
B.S. in C.E., Massachusetts Institute of Technology, 1932; Ed.M. Boston University, 1946; C.A.G.S. Boston University, 1956; Instructor in Mathematics, Everett High School.	
<i>Mathematics</i>	
<b>Rudolph P. Widman</b>	Appointed 1963
A.B. Eastern Nazarene College, 1963; M.S. Northeastern University, 1965; Instructor of Chemistry, Curry College.	
<i>Chemistry</i>	
<b>Joseph F. Willard</b>	Appointed 1949
B.S. Northeastern University, 1949; P.E. (Mass.); Senior Civil Engineer, Electronic Computer Section, Massachusetts Department of Public Works.	
<i>Civil Engineering Technology</i>	
<b>Donald K. Willim</b>	Appointed 1961
B.S. Maryland University, 1957; M.S. Northeastern University, 1961; P.E. (Mass.); Staff, Massachusetts Institute of Technology, Lincoln Laboratory.	
<i>Physics</i>	
<b>Albert G. Wilson, Jr.</b>	Appointed 1948
B.S. in Civil Engineering, Thayer School, Dartmouth, 1946; M.S. Case Institute of Technology, 1948; P.E. (Mass.); S.E. (III.); Member Gilbert Small & Co., Consulting Engineers.	
<i>Course Consultant for Mechanical Engineering Technology</i>	
<b>Kenneth S. Woodard</b>	Appointed 1962
B.S.A.E. Tri-State College, 1951; Associate Professor of Graphic Science, Northeastern University.	
<i>Mechanical Engineering Technology</i>	

**Gerald L. Woodland, Jr.**

Appointed 1966

B.S. University of Massachusetts, 1957; M.S. Northeastern University, 1959; P.E. (Mass., New York); Engineer, Structural Division, Stone & Webster Corporation.

*Engineering Graphics and Computation*

**Robert L. Wright, Jr.**

Appointed 1958

B.S.M.E. Rensselaer Polytechnic Institute, 1953; M.S.M.E. Northeastern University, 1961; P.E. (Mass.); Assistant Professor of Mechanical Engineering, Northeastern University.

*Mechanical Engineering Technology*



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19

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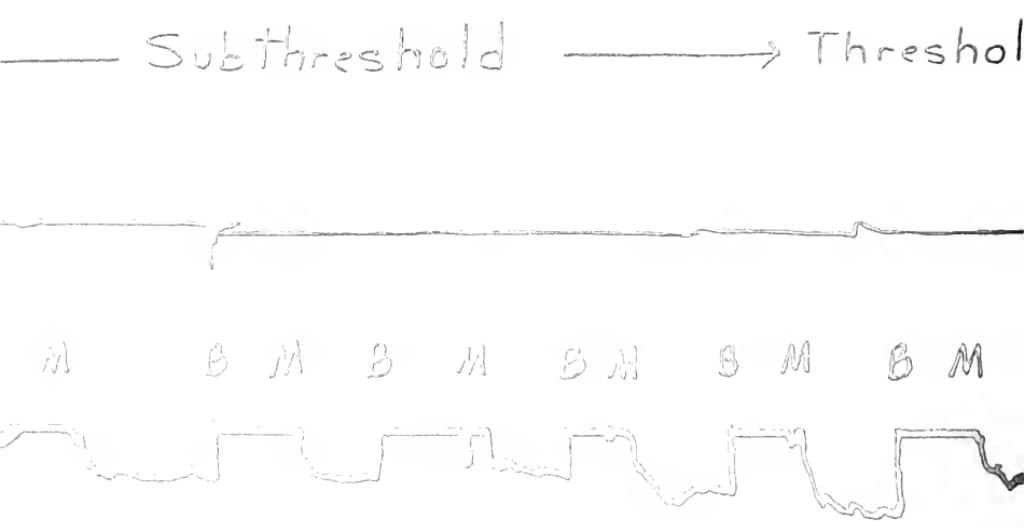
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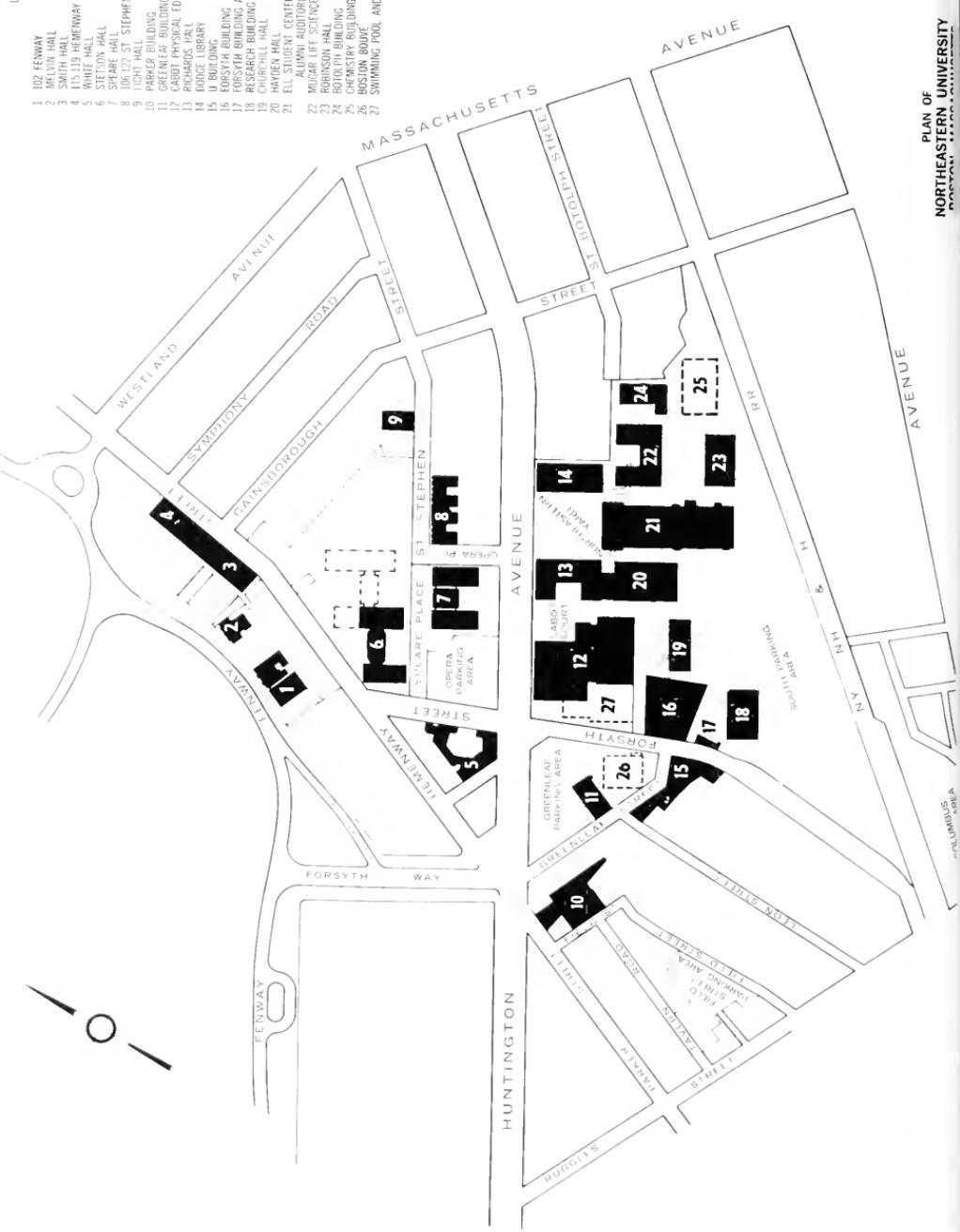


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3. SMITH HALL  
4. 115-119 HENRICKSON STREET  
5. WHITE HALL  
6. STETSON HALL  
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# *Aims and Scope of the University*

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), and by Boston-Bouvé College (1964). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, programs of study have been developed to meet a variety of needs. Since 1906 evening curricula have been offered leading to the bachelor's degree. These programs in the arts and sciences, engineering, various fields of business, law enforcement and security, and other areas have been carefully planned to serve mature students who are employed full time during the day but who are desirous of broadening their educational background by part-time study. All formal courses of study leading to degrees through evening programs are approved by the appropriate Basic College faculties and are subject to the same quantitative and qualitative standards as the regular day curricula.

The following is a brief outline of the aims and scope of the University's programs.

## I. THE TEN COLLEGES

### 1. BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study — Physical Education, Recreation, and Physical Therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Co-operative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### 2. THE COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

### 3. COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

### 4. THE COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

## **5. THE COLLEGE OF ENGINEERING**

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

## **6. THE COLLEGE OF LIBERAL ARTS**

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Co-operative Plan.

## **7. LINCOLN COLLEGE**

Lincoln College offers technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also offers science technology and paramedical technology programs leading to the Associate in Science degree.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet the special needs of part-time students.

## **8. THE COLLEGE OF NURSING**

The College of Nursing offers two separate and distinct programs of study, both organized on the Co-operative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable co-operative work opportunities during the upper-class years of these programs.

## **9. THE COLLEGE OF PHARMACY**

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

## **10. UNIVERSITY COLLEGE**

University College, so called because it draws upon the resources of the other Colleges of the University, offers courses of study leading to certificates, Associate in Science and Bachelor of Science degrees. University College offers both day and evening programs designed specifically to meet the needs of adult students who wish to undertake part-time curricula during late afternoon or evening hours and on Saturdays. In co-operation with the Forsyth School for Dental Hygienists, University College also offers a two-year day curriculum leading to the Associate in Science degree.

Quality standards of instruction and requirements for the degrees offered by University College are wholly consistent with those of the other Colleges of the University. University College does not duplicate the offerings of the eight Basic Colleges but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adults desiring formal programs of professional development on a part-time basis, or of young people enrolled in professional schools affiliated with Northeastern University.

## **II. THE GRADUATE DIVISION**

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

### **ACTUARIAL SCIENCE**

Master of Science in Actuarial Science.

### **ARTS AND SCIENCES**

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, and Psychology.

### **BUSINESS ADMINISTRATION**

Master of Business Administration.

### **EDUCATION**

Master of Education.

### **ENGINEERING**

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

### **PHARMACEUTICAL SCIENCES**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

### **PROFESSIONAL ACCOUNTING**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

### **III. CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working co-operatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

### **IV. AFFILIATED PROGRAMS**

#### **1. FOR DENTAL HYGIENISTS**

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

#### **2. FOR MEDICAL TECHNOLOGISTS**

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

#### **3. FOR NURSES**

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

### **V. RESEARCH ACTIVITIES**

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

# *Buildings and Facilities*

Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South Stations. To reach the University from the North Station, board an MBTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

## **HUNTINGTON AVENUE CAMPUS**

The principal educational buildings of Northeastern University are located on Huntington Avenue on 16 acres of a 47-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 4.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to nine new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The newer buildings are interconnected by means of tunnels.

In addition to classrooms and instructional offices, the principal buildings and facilities are:

**Botolph Building.** Civil Engineering Laboratories.

**Cabot Physical Education Center.** Facilities for physical education and athletics; gymnasium; cage; rifle range.

**Churchill Hall.** Graduate Division; Physics Laboratories; faculty and staff cafeteria.

**Dodge Library.** Library; Center for Programmed Instruction; Engineering drawing rooms; Language Laboratory.

**EII Student Center.** Student activities; chapel; auditorium; student cafeteria; bookstore; student lounges and meeting rooms.

**102 The Fenway.** Center for Reading Improvement; Stearns Center for Research; gymnasium.

**Forsyth Building.** Laboratories for Industrial Engineering, Mechanical Engineering, and Allied Medical Sciences; planetarium; University Infirmary and Health Services.

**Greenleaf Building.** ROTC headquarters; research facilities.

**Hayden Hall.** Lincoln College; University College; Colleges of Business Administration, Education, Engineering, and Liberal Arts; Electrical Engineering Laboratories.

**Mugar Life Sciences Building.** College of Pharmacy; laboratories for Biology, Chemical Engineering, and Psychology.

**Research Building.** Research facilities for Electrical Engineering and Physics.

**Richards Hall.** Administrative offices; laboratories for Chemistry and Mechanical Engineering; bookstore.

**Robinson Hall.** Boston-Bouvé College; College of Nursing; laboratories for Biology and Physical Therapy; radio and television facilities.

**United Realty Building.** Research facilities for Mechanical Engineering, Biology, Psychology, and Chemistry; Institute for Rehabilitation.

### SUBURBAN CAMPUS AT BURLINGTON

In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

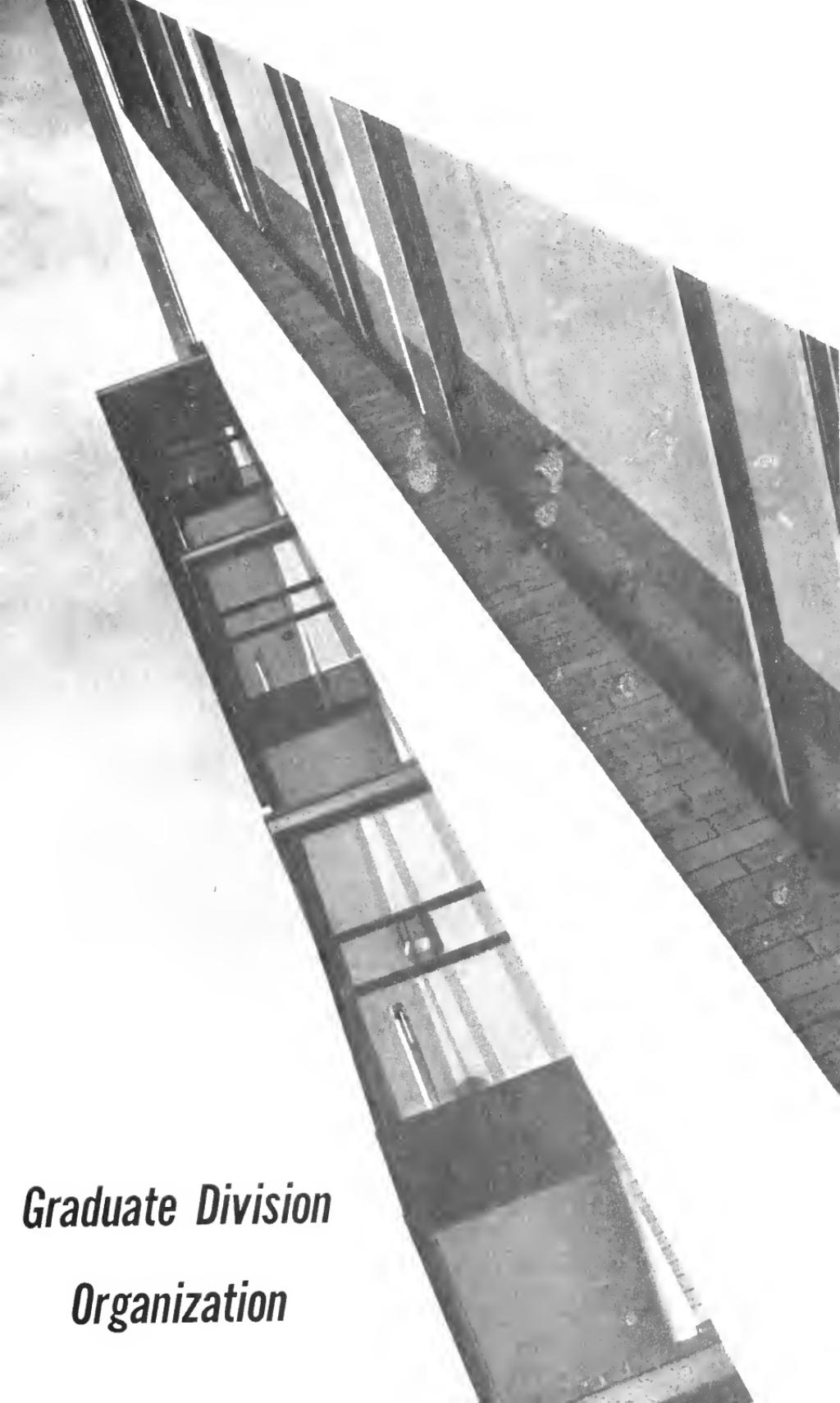
In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-art programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

### HENDERSON HOUSE

At Henderson House in Weston, Massachusetts, Northeastern University operates one of the nation's finest off-campus centers for continuing education. Adults enroll in short-term courses, seminars, and special institutes at this conference center, located 12 miles from the main campus on Huntington Avenue.

### WARREN CENTER

A 70-acre tract in Ashland, including a small lake, is being developed for use as a laboratory for instruction in physical education and recreation.



*Graduate Division  
Organization*

## **Graduate Schools and Degree Programs**

**GRADUATE SCHOOL OF ACTUARIAL SCIENCE**  
MASTER OF SCIENCE IN ACTUARIAL SCIENCE

**GRADUATE SCHOOL OF ARTS AND SCIENCES**  
MASTER OF ARTS DEGREES  
in the fields of  
ECONOMICS, ENGLISH, HISTORY, POLITICAL SCIENCE,  
PSYCHOLOGY, and SOCIOLOGY-ANTHROPOLOGY

MASTER OF SCIENCE DEGREES  
in the fields of  
BIOLOGY, CHEMISTRY, HEALTH SCIENCES,  
MATHEMATICS, and PHYSICS

DOCTOR OF PHILOSOPHY DEGREES  
in the fields of  
BIOLOGY, CHEMISTRY, MATHEMATICS, PHYSICS, AND PSYCHOLOGY

**GRADUATE SCHOOL OF BUSINESS ADMINISTRATION**  
MASTER OF BUSINESS ADMINISTRATION

**GRADUATE SCHOOL OF EDUCATION**  
MASTER OF EDUCATION

**GRADUATE SCHOOL OF ENGINEERING**  
MASTER OF SCIENCE DEGREES  
in the fields of  
CHEMICAL, CIVIL, ELECTRICAL, INDUSTRIAL,  
and MECHANICAL ENGINEERING,  
ENGINEERING MANAGEMENT  
DOCTOR OF PHILOSOPHY DEGREES  
in the fields of  
CHEMICAL, ELECTRICAL, and MECHANICAL ENGINEERING

**GRADUATE SCHOOL OF PHARMACEUTICAL SCIENCES**  
MASTER OF SCIENCE IN HOSPITAL PHARMACY  
MASTER OF SCIENCE IN INDUSTRIAL PHARMACY  
MASTER OF SCIENCE IN MEDICINAL CHEMISTRY  
MASTER OF SCIENCE IN PHARMACOLOGY

**GRADUATE SCHOOL OF PROFESSIONAL ACCOUNTING**  
MASTER OF SCIENCE IN ACCOUNTING

## GRADUATE DIVISION

### GENERAL ADMINISTRATION

Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Janice Walker, A.B.	Registrar of the Graduate Division
W. Dennis Stires, B.S.	Administrative Assistant in the Graduate Division
Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M.	Administrative Assistant in the Graduate Division

### DIRECTORS OF THE GRADUATE SCHOOLS

Bernard J. Brent, B.S., M.S., Ph.D.	Graduate School of Pharmaceutical Sciences
Geoffrey Crofts, B.Comm., F.S.A.	Graduate School of Actuarial Science
Ray C. Dethy, B.S., M.A., Ph.D.	Graduate School of Education
Joseph M. Golemme, B.S., M.A.	Graduate School of Professional Accounting
George W. Hankinson, A.B., S.B., M.S.	Graduate School of Engineering
Daniel J. McCarthy, A.B., M.B.A., D.B.A.	Graduate School of Business Administration
Arthur A. Vernon, B.S., M.S., Ph.D.	Graduate School of Arts and Sciences

### UNIVERSITY GRADUATE COMMITTEE

#### 1966-67

The responsibility of the committee is the determination of broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the committee.

#### Administrative Members

Arthur A. Vernon, Chairman	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, Secretary	Registrar of the Graduate Division
Bernard J. Brent	Professor of Medicinal Chemistry and Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts	Dean of the Graduate School of Actuarial Science
Ray C. Dethy	Assistant Dean of Education and Director of the Graduate School of Education
Arthur E. Fitzgerald	Dean of the Faculty
Joseph M. Golemme	Director of the Graduate School of Professional Accounting

George W. Hankinson	Assistant Dean of Engineering and Director of the Graduate School of Engineering
LeRoy C. Keagle	Dean of Pharmacy
Wilfred S. Lake	Dean of Liberal Arts
Frank E. Marsh, Jr.	Dean of Education
Daniel J. McCarthy	Assistant Dean of Business Administration and Director of the Graduate School of Business Administration
Kenneth G. Ryder	Dean of Administration
Ronald E. Scott	Dean of Engineering
Harry E. Wilkinson, Jr.	Dean of Business Administration
Roy L. Wooldridge	Dean of Co-operative Education

**Elected Faculty Members****Terms Expire September, 1967**

Anker V. Andersen	Associate Professor of Accounting
David R. Cook	Associate Professor of Education
Robert J. Ferullo	Associate Professor of Special Education
Bernard M. Goodwin	Associate Professor of Chemical Engineering
John F. Reinhard	Professor of Pharmacology and Chairman of the Department
Nathan W. Riser	Professor of Biology and Director of the Marine Science Institute
Anghel N. Rugina	Professor of Economics and Finance
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
Albert H. Soloway	Associate Professor of Medicinal Chemistry
Ernest L. Spencer	Professor of Civil Engineering and Chairman of the Department

**Terms Expire September, 1968**

Wendell R. Brown	Associate Professor of Social Science Education
John F. Dunn	Professor of Mechanical Engineering
George M. Krause	Professor of Pharmacy
Robert W. Mullins	Associate Professor of Management
Robert J. Minichiello	Associate Professor of Marketing
Harold R. Raemer	Professor of Electrical Engineering and Chairman of the Department
Raymond H. Robinson	Professor of History and Chairman of the Department
George B. Rochfort, Jr.	Associate Professor of Education
Elliot Spector	Professor of Pharmacology
A. Bertrand Warren	Professor of Psychology and Chairman of the Department

# *General Graduate Division Regulations*

## **REGISTRATION**

Students must register in the Graduate Division Office at the times specified by the Graduate School calendar.

## **PROGRAM CLASSIFICATIONS**

Students who have registered for a degree program in the Graduate Division are given a program classification in one of the curricula listed in the catalog. Students who are not pursuing a specific degree program are entered upon the Graduate Division records as special.

## **RESIDENCE**

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

## **PROGRAMS OF STUDY**

At the time of his first registration, each full-time student must develop, with the assistance of his faculty advisor, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty advisor.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school concerned.

## GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

- A. Excellent  
This grade is given to those students whose performance in the course has been of very high graduate caliber.
- B. Satisfactory  
This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.
- C. Fair  
This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.
- F. Failure  
This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

- I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.
- S. Satisfactory, without quality designation. This designation is used for thesis and seminar work.
- W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within four weeks after the quarter ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within one week following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

## WITHDRAWALS

Students who wish to withdraw from a course after the start of the quarter must file an official withdrawal form in the Graduate Division Office. Any student who is absent for three class periods in succession without excuse will be dropped from the class.

The University provides all instruction and accommodations on an academic quarter basis; therefore, no refunds are granted except in cases where students are compelled to withdraw because of personal illness or other reasons beyond their control. In no case are refunds made after a student has attended the fifth session of a class. Questions regarding refunds should be discussed with the Bursar's Office.

## CLASS HOURS AND CREDITS

All credits are entered as quarter hours. A quarter hour is defined as the equivalent of one hour in class and two hours of outside preparation for twelve weeks. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the sessions.

## INTERVIEW AND REGISTRATION DATES, OFFICE HOURS, AND CLASS SCHEDULES

For dates of the interview and registration periods and office hours, consult the calendar pages. Circulars listing the times at which courses are given are issued at the beginning of the academic year. Copies of these circulars may be obtained from the office of the Graduate Division, Northeastern University, Boston, Massachusetts 02115, or by calling 262-1100.

## THE MASTER'S DEGREE

### ADMISSION

Specific requirements for each department will be found in the appropriate paragraph under each departmental heading. The necessary material for admission for full-time graduate study must be filed by March 15, unless other filing dates are indicated by the respective graduate schools. Applications for all fields except for those in the Graduate Schools of Actuarial Science, Pharmaceutical Sciences, and Professional Accounting should be made directly to the Graduate Division Office.

For admission to any part-time program, a personal interview with the director of the appropriate graduate school or the head of a department is required. Transcripts of the applicant's prior college training must be presented at that time. If this is not possible, such material must be filed within six weeks after registration or the student will be asked to withdraw.

### ACADEMIC CLASSIFICATIONS

After review of an applicant's transcript of undergraduate work, those students who are admitted are given an academic classification as regular or provisional. Those who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular. Those who have an undergraduate record which is not acceptable for regular classification are classified as provisional. Provisional students must obtain a B average in the first 16 quarter hours of credit work for which they register in order to continue in the Graduate Division. Students whose records are not satisfactory may be dropped prior to the completion of this amount of work. When provisional students obtain a B average in the first 16 quarter hours of credit work, they will be classified as regular students. The Graduate Division requirements apply to both classified and special students.

## GENERAL REQUIREMENTS

A candidate for the master's degree must complete satisfactorily an approved program conforming to the requirements of the department or graduate school in which he is registered.

The requirements for the master's degree are a minimum of 40 quarter hours of correlated work of graduate caliber, together with such other study as may be required by the department or graduate school concerned. Department chairmen and the directors of the graduate schools are available for counsel on the selection of electives.

## ACADEMIC REQUIREMENTS

In order to qualify for the master's degree, an average no lower than B must be obtained in the necessary quarter hour credits required for the degree. If a grade of F is obtained in a required course, this course must be repeated with a passing grade. If a grade of C is obtained in a required course, this course may be repeated once only. If a grade of F is obtained in an elective course, this course may be either repeated with a passing grade, or another elective course may be substituted for it. In order to satisfy the academic requirements for the degree, three extra courses will be allowed for students in all graduate schools except the Graduate School of Education, in which two extra courses will be allowed.

## COMPREHENSIVE EXAMINATION

At the discretion of the department, a final written or oral comprehensive examination may be required. No candidate may present himself for the final comprehensive examination without the permission of his faculty advisor. Such examinations must be taken at least two weeks before the commencement at which he expects to receive his degree.

## THESIS

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material. The thesis should show evidence that the student has a thorough acquaintance with the literature of a limited field and must meet the approval of the department or graduate school concerned.

Instruction concerning the details of preparation of the thesis may be obtained from the Graduate Division Office.

## FOREIGN LANGUAGE REQUIREMENT

Some departments require an examination to show evidence of ability to read one or more foreign languages. This reading knowledge is established by an examination arranged by the department concerned.

### **TRANSFER CREDITS**

After a student has been accepted for graduate study toward the master's degree he may submit a request for transfer credit. A maximum of 12 quarter hours of graduate credit may be accepted toward a master's degree if such work is approved by the director of the graduate school concerned or the Departmental Graduate Study Committee. Transfer credit will be considered only if the work is consonant with the objectives of the graduate program and if the grades in the courses are A or B. No grades on transfer credits may be used for purpose of obtaining the academic average necessary for completion of the degree requirements.

### **TIME LIMITATIONS**

Course credits earned in the program of graduate study are valid for a maximum period of eight years. This time limitation is likewise applicable to any accepted transfer credits.

## **THE DOCTOR'S DEGREE**

Northeastern University offers programs leading to the degree of Doctor of Philosophy in the following fields: chemical engineering, electrical engineering, mechanical engineering, chemistry, mathematics and physics.

The degree is awarded to candidates who give evidence of proficiency, high attainment, and research ability in their major field and who have satisfied the specific requirements of the department in which they are enrolled.

### **GENERAL REQUIREMENTS**

A minimum of 40 quarter hours of graduate course work is required for those studying for the doctoral degree. The amount above this is specified for each candidate by the departmental graduate committee. The other requirements include a qualifying examination, completion of the residence requirement, a comprehensive examination, demonstration of foreign language proficiency, completion of an approved thesis, and a final oral examination. It is the responsibility of departmental graduate committees to certify to the Graduate Division the completion of each requirement.

### **RESIDENCE REQUIREMENT**

Candidates for the doctoral degree must spend the equivalent of at least one academic year in residence at the University taking graduate work and/or working on a thesis. Each department specifies the method by which the residence requirement is satisfied. The period of residence must be continuous; however, it need not be on a full-time basis.

## DEGREE CANDIDACY

After 40 quarter hours of graduate work have been taken with satisfactory grades and after successful completion of the qualifying examination, a student is established as a degree candidate.

## QUALIFYING EXAMINATION

In order to become a doctoral degree candidate, each student must pass a qualifying examination. This examination may be either written or oral, or both, at the discretion of the department.

## COMPREHENSIVE EXAMINATION

During the time in which a student is a candidate for a doctoral degree, he must demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of such degree.

## COURSE REQUIREMENT

The course requirements, in addition to the minimum requirement of 40 quarter hours' credit, are established by the departmental graduate committee for each candidate.

## THESIS

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the theoretical and/or experimental results of the research. The original bound copy of the thesis will be retained by the Library. Northeastern University reserves publication rights to the material presented in the thesis.

## FOREIGN LANGUAGE

Before a candidate may take the final oral examination, he must demonstrate a foreign language proficiency as required by the department. This reading knowledge is established by the examination administered by the department in which the candidate is registered.

## FINAL ORAL EXAMINATION

The final oral examination will be taken after completion of all other requirements for the degree. This examination cannot be held until after the thesis has been received in the Graduate Division Office and must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the departmental graduate committee, and the Dean of the Graduate Division is notified of the time of the examination.

The final oral examination will include the subject matter of the doctoral thesis and significant developments in the field of the thesis work. Other fields may be included if recommended by the examining committee.

### **TRANSFER CREDIT**

The graduate course work which a student must take beyond the basic 40 quarter hours is established by each departmental graduate committee, and if transfer credit is desired for any of this work, approval of the departmental graduate committee must be obtained. In general, no more than one half of the course work required beyond the basic 40 credits will be accepted for transfer credit.

### **TIME LIMITATION**

After admission to degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements.

### **REGISTRATION**

The program of each student must be approved by his advisor before registering in the Graduate Division Office.

### **CLASSIFICATION OF DOCTORAL CANDIDATES**

1. Students who have completed 40 quarter hours of graduate work and have been accepted by the department for doctoral study, but have not yet passed the qualifying examination, are classified as pre-doctoral students.
2. Students who have completed 40 quarter hours of graduate work and have passed the qualifying examination are classified as doctoral students.

### **INTERDISCIPLINARY PROGRAMS**

Some graduate students may wish to pursue doctoral programs whose boundaries overlap substantially into two or more departments. In such cases, an interdisciplinary program may be established which is adequate in scope and depth for doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

### **ADMISSION**

It is expected that students enrolled in graduate work at Northeastern University and who wish to apply for an interdisciplinary doctoral program, will complete the requirements for the master's degree in an established course of study. The department in which the student completed his master's degree work will act upon the request to pursue an interdisciplinary program. If such an application is approved, the department will serve as the registration department for the doctoral degree requirements.

If an applicant has obtained a master's degree from another institution and wishes to pursue an interdisciplinary doctoral program at Northeastern University, an application to do so should be filed with an appropriate department which is authorized to award the doctoral degree. This department will act upon the request and, if granted, will serve as the registration department.

### **FORMATION OF INTERDISCIPLINARY COMMITTEE**

A student who has been accepted by a department for an interdisciplinary program must find an advisor who will direct his doctoral thesis. This advisor will be chairman of the interdisciplinary committee for this student. A second member will be appointed by the chairman of the registration department. These two members may obtain a third member or request the Dean of the Graduate Division to do so. At least two departments must be represented on the committee. The chairman of the registration department will notify the Dean of the Graduate Division of the membership of the committee as soon as arrangements are complete.

### **DUTIES OF INTERDISCIPLINARY COMMITTEE**

The chairman of the interdisciplinary committee will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the departmental committee member. The departmental committee member will serve as the reporting and recommending representative to the departmental graduate committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the thesis, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represent standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the Dean of the Graduate Division to determine whether objectives of the program are being met. If any questions arise, they should be discussed with the interdisciplinary committee.

# *Tuition and Fees*

## **TUITION**

### **CO-OPERATIVE PROGRAMS**

Graduate School of Actuarial Science .....	\$425 per quarter
Graduate School of Arts and Sciences .....	\$400 per quarter
Graduate School of Engineering .....	\$525 per quarter
Graduate School of Pharmaceutical Sciences .	\$525 per quarter
Graduate School of Professional Accounting .	\$500 per quarter

### **FULL-TIME DOCTORAL PROGRAMS**

Graduate School of Arts and Sciences .....	\$500 per quarter
Graduate School of Engineering .....	\$500 per quarter

### **OTHER GRADUATE PROGRAMS**

Graduate School of Arts and Sciences	
Courses on Huntington Avenue	
Campus .....	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit
Graduate School of Business Administration	
Courses on Huntington Avenue	
Campus .....	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit
Graduate School of Education	
Courses on Huntington Avenue	
Campus .....	\$25 per quarter hour credit
Courses on Burlington Campus	\$25 per quarter hour credit
Guidance Practicum .....	\$100
Student Teaching .....	\$200
Graduate School of Engineering	
Courses on Huntington Avenue	
Campus .....	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit

**FEES**

<b>REGISTRATION FEE .....</b>	\$10.00
Payable at time of first registration in all graduate schools except for non-degree students in the Graduate School of Education.	
<b>LATE PAYMENT FEE .....</b>	\$ 5.00
For failure to pay tuition on due date.	
<b>MAKE-UP FEE .....</b>	\$ 5.00
<b>MEDICAL INSURANCE FEE .....</b>	\$18.00
For full-time students.	

**STUDENT CENTER CHARGES**

Graduate School of Actuarial Science

Co-operative Students ... \$10.00 per ten-week term of registration

Graduate School of Arts and Sciences

Co-operative Students ... \$12.50 per quarter of registration

Other Full-Time Students . \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Business Administration

Full-Time Students ..... \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Education

Full-Time Students ..... \$12.50 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Engineering

Co-operative Students ... \$12.50 per quarter of registration

Other Full-Time Students . \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Graduate Co-operative

Teaching Assistants ... \$ 6.25 per quarter of registration

Graduate Co-operative

Research Assistants .. \$ 6.25 per quarter of registration

**Part-Time Students**

Registered on the  
Huntington Avenue

Campus . . . . . \$ 0.75 per quarter of registration

**Graduate School of Pharmaceutical Sciences**

Co-operative Students . . . \$12.50 per quarter of registration

**Graduate School of Professional Accounting**

Co-operative Students . . . \$12.50 per quarter of registration

**GRADUATION FEE** . . . . . \$25.00

Payable by all students at time of award of degree.

**PAYMENTS**

Tuition statements will be mailed to the students by the Student Accounts Office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

**FINANCIAL AID**

Northeastern University has available fellowships and assistantships for students who are engaged in graduate work. The Graduate Division will send candidates the proper application blanks upon request.

**TEACHING ASSISTANTSHIPS**

Teaching assistantships are available in most of the departments giving graduate work. Holders of such assistantships carry a half-time academic load and devote half time to academic assistance in the departments. The assistantship grant includes a stipend and remission of tuition.

**TUITION FELLOWSHIPS**

Some departments have available tuition fellowships which cover six to nine quarter hours of graduate work per quarter. In return, students will be required to assist in the academic work of the department. These fellowships are normally given to students who are in the first year of graduate work.

**RESEARCH FELLOWSHIPS**

Research fellowships are available in some departments giving graduate work. Holders of such fellowships carry a half-time academic load and devote half time to academic assistance in the departments. The fellowship grant includes a stipend and remission of tuition.

## DOCTORAL RESEARCH FELLOWSHIPS

In the departments which give work leading to the Ph.D. degree, research fellowships are available for students who have established candidacy for the Ph.D. degree. These fellowships carry remission of tuition, and the stipend is higher than that for the research fellowships.

## GRADUATE CO-OPERATIVE TEACHING ASSISTANTSHIPS

Some engineering departments have graduate co-operative teaching assistantships available for students for the master's degree on the Co-operative Plan. Holders of these assistantships alternate periods of academic work with periods of assistance in the department according to the co-operative calendar. Remission of tuition is given in addition to the compensation for the assistantship.

## GRADUATE CO-OPERATIVE RESEARCH FELLOWSHIPS

Some engineering departments have graduate co-operative research fellowships available for students studying for the master's degree on the Co-operative Plan. Holders of such fellowships alternate full-time research work with academic work according to the co-operative calendar. Remission of tuition is given in addition to the compensation for the fellowship.

## APPOINTMENTS

Appointments to fellowships and assistantships are ordinarily announced by April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed.

## FULL-TIME DUTIES

Graduate students who hold teaching assistantships and research fellowships, graduate co-operative teaching assistantships, or graduate co-operative research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisor and the Dean of the Graduate Division.

## NATIONAL DEFENSE STUDENT LOAN PROGRAM

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one half the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$2,500. The total of loans made to a student for all years, including any loans made to him as an undergraduate, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

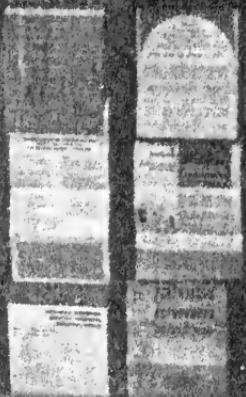
Repayment of these loans begins nine months after the date the borrower ceases to carry, at an institution of higher education, at least one half the normal full-time academic workload as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, the cancellation rate is 15 per cent for each complete year of service; and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and appropriate application forms are available through the Graduate Division Office or from the Office of Financial Aid. The application deadline is September 1 for full-time students or one month prior to the start of the quarter for which aid is requested in the case of half-time students.



# GRADUATE SCHOOL



*Degree Programs  
of the  
Graduate School of Arts and Sciences*

Master of Arts Degrees  
in the fields of  
Economics, English, History, Political Science,  
Psychology, and Sociology-Anthropology

Master of Science Degrees  
in the fields of  
Biology, Chemistry, Health Sciences, Mathematics, and Physics

Doctor of Philosophy Degrees  
in the fields of  
Biology, Chemistry, Mathematics, Physics, and Psychology

## ACADEMIC CALENDAR

### Summer Session 1967

Registration Period for Former Students	Monday-Friday	May 29-June 9
*Interview and Registration Period for New Students	Monday-Friday	May 29-June 9
Classes Begin	Monday	June 19
Independence Day, No Classes	Tuesday	July 4
Classes End	Tuesday	July 25
Examination Period	Wednesday-Saturday	July 26-July 29

### Fall Quarter 1967

Registration Period for Former Students	Monday-Saturday	Aug. 7-Aug. 26
*Interview and Registration Period for New Students	Monday-Saturday	Aug. 21-Sept. 9
Classes Begin	Monday	Sept. 18
Columbus Day, No Classes	Thursday	Oct. 12
Thanksgiving, No Classes	Thursday-Friday	Nov. 23 & 24
Examination Period	Monday-Friday	Nov. 27-Dec. 1

### Winter Quarter 1967-68

Change of Registration for Former Students	Monday-Friday	Nov. 27-Dec. 1
*Interview and Registration Period for New Students	Monday-Friday	Nov. 27-Dec. 1
Classes Begin	Monday	Dec. 11
Christmas Vacation, No Classes	Saturday-Monday	Dec. 23-Jan. 1
Washington's Birthday, No Classes	Thursday	Feb. 22
Examination Period	Monday-Friday	Mar. 4-Mar. 8

### Spring Quarter 1968

Change of Registration for Former Students	Monday-Friday	Feb. 26-Mar. 1
Classes Begin	Monday	Mar. 18
Patriot's Day, No Classes	Friday	Apr. 19
Final Grades for June Graduates		
Taking Third Quarter Courses	Friday	May 24
Memorial Day, No Classes	Thursday	May 30
Examination Period	Monday-Friday	June 3-June 7

\*Appointments for interviews with new students must be made at least four days before the date of the interview.

## GENERAL INFORMATION

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level, and the University reserves the right to cancel any course for which an insufficient number of students apply.

## ASSISTANTSHIPS AND FELLOWSHIPS

Teaching assistantships are available in all of the departments of the Graduate School of Arts and Sciences. In addition, some of the departments have research fellowships available for students enrolled for work leading to the master's degree. Applications for fellowships must be filed by March 15, with two letters of recommendation and a transcript of all prior college work. Holders of assistantships must have their course program approved by the chairman of the department concerned before the student registers in the Graduate Division Office.

## CO-OPERATIVE PROGRAM

The Departments of Mathematics and Sociology-Anthropology offer full-time programs on the Co-operative Plan. On this plan, students alternate academic work with professional employment on the quarter system. The details are given in the sections which describe the academic programs of the departments. The staff of the Department of Guidance and Placement of the Division of Co-operative Education will arrange for employment of co-operative graduate students.

Applicants for these programs must file two letters of recommendation and a copy of all prior college work as soon after January 15 as possible. The admissions committee will notify applicants as soon as their material is complete.

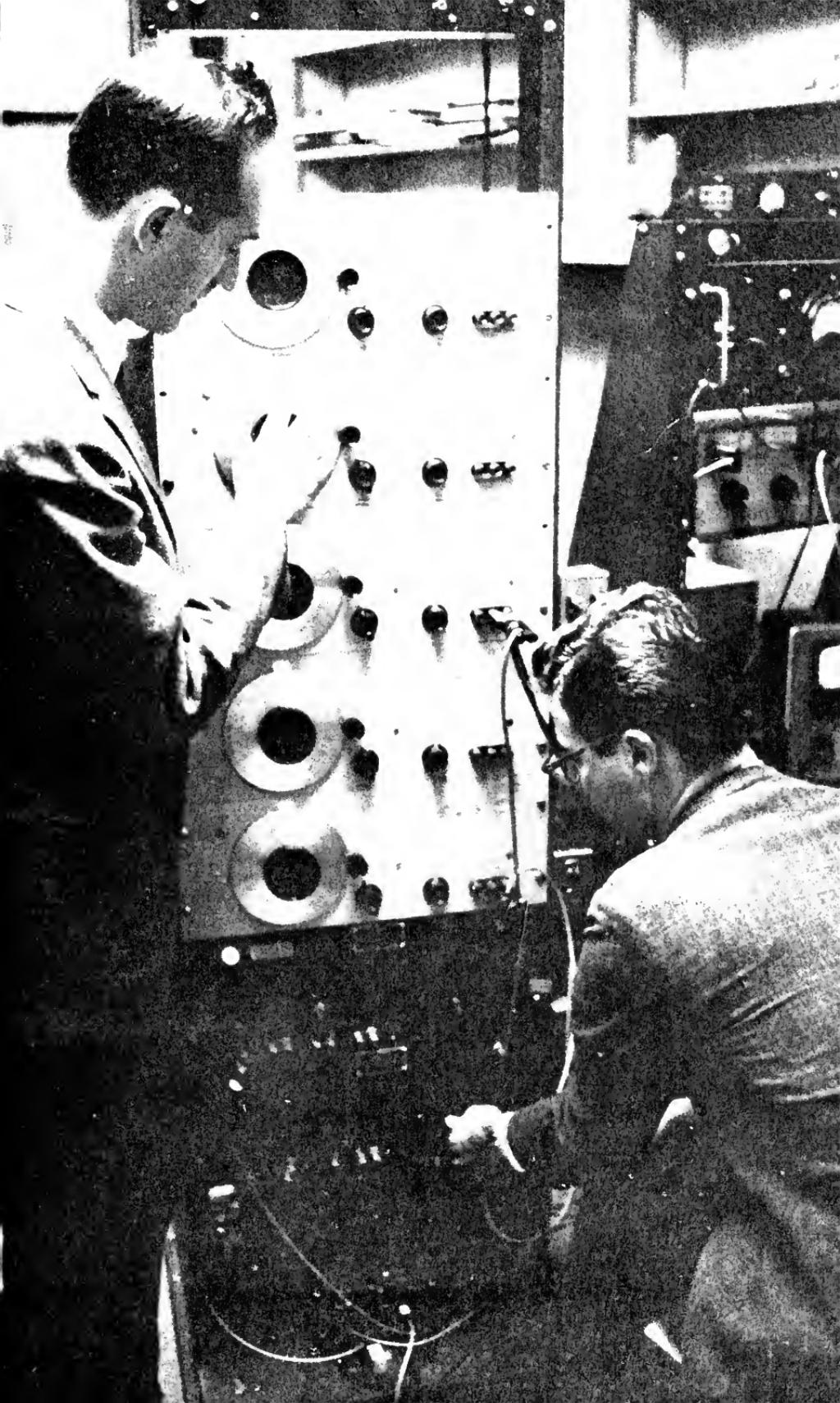
## PART-TIME EVENING PROGRAM

Most of the departments offer part-time evening programs in which the admission requirements are the same as for full-time programs. However, the programs are established in such a way that students may progress according to their abilities and the time available. The curricula of the part-time evening programs are specified by the departments. All part-time students must register in the Graduate Division Office. New students are registered by appointment with the Director of the Graduate School of Arts and Sciences at the time specified in the academic calendar. Transcripts of prior college work must be presented at this time.

COMMITTEE ON GRADUATE STUDY  
IN  
ARTS AND SCIENCES

1966-67

Arthur A. Vernon, S.B., M.S., Ph.D., Chairman	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
David W. Barkley, B.A., M.A., Ph.D.	Professor of Political Science
Morris A. Horowitz, A.B., M.A., Ph.D.	Professor of Economics and Chairman of the Department
Victor E. Howes, A.B., Ph.D.	Professor of English and Chairman of the Department
Reginald G. Lacount, S.B., M.A., Ph.D.	Professor of Physics and Chairman of the Department
Wilfred S. Lake, A.B., M.A., Ph.D.	Dean of Liberal Arts
Frank F. Lee, B.A., M.A., Ph.D.	Professor of Sociology and Chairman of the Department
Raymond H. Robinson, B.A., M.A., Ph.D.	Professor of History and Chairman of the Department
Robert A. Shepard, B.S., Ph.D.	Professor of Chemistry and Chairman of the Department
Harold L. Stubbs, A.B., M.A., Ph.D.	Professor of Mathematics and Chairman of the Department
A. Bertrand Warren, A.B., M.A., Ph.D.	Professor of Psychology and Chairman of the Department
Henry O. Werntz, B.S., Ph.D.	Associate Professor of Biology and Acting Chairman of the Department



**FACULTY**

<b>Ronald Aaron</b>	<b>Assistant Professor of Physics</b>
B.A., Temple University; Ph.D., University of Pennsylvania	
<b>Arthur E. Albert</b>	<b>Lecturer in Mathematics</b>
B.S., Massachusetts Institute of Technology; Ph.D., Stanford University	
<b>Jonas Alster</b>	<b>Assistant Professor of Physics</b>
Ph.D., Technical University in Delft, Holland	
<b>Kurt Arbenz</b>	<b>Lecturer in Mathematics</b>
M.S., Ph.D., Swiss Federal Institute of Technology	
<b>Albert Arcese</b>	<b>Lecturer in Mathematics</b>
B.S., Northeastern University; M.A., Boston University	
<b>Edward A. Arees</b>	<b>Assistant Professor of Psychology</b>
B.B.A., M.S., City College of New York; Ph.D., University of Massachusetts	
<b>Richard Arnowitt</b>	<b>Professor of Physics</b>
B.S., M.S., Ph.D., Rensselaer Polytechnic Institute	
<b>Philip N. Backstrom</b>	<b>Associate Professor of History</b>
B.A., Gordon College; Ph.D., Boston University	
<b>David W. Barkley</b>	<b>Professor of Political Science</b>
B.A., M.A., Ph.D., University of Southern California; M.P.A., Harvard University	
<b>Fred A. Barkley</b>	<b>Professor of Biology</b>
B.A., M.S., University of Oklahoma; Ph.D., Washington University	
<b>James T. Barrs</b>	<b>Professor of English</b>
B.A., University of Georgia; M.A., Ph.D., Harvard University	
<b>John A. Bergeron</b>	<b>Associate Professor of Economics</b>
B.A., Merrimack College; Ph.D., Massachusetts Institute of Technology	
<b>Perry A. Bialor</b>	<b>Instructor in Sociology</b>
B.A., Columbia College; M.A., University of Chicago	

<b>Wallace P. Bishop</b>	<b>Associate Professor of History</b>
B.A., Brown University; M.A., Columbia University; Ph.D., Boston University	
<b>Eugene J. Blackman</b>	<b>Professor of Drama and Chairman of the Department</b>
B.S., M.A., Boston University	
<b>Raymond E. Blois</b>	<b>Associate Professor of English</b>
B.S., Boston University; M.A., Harvard University; Ph.D., Boston University	
<b>Robert A. Bonic</b>	<b>Associate Professor of Mathematics</b>
M.S., University of Chicago; Ph.D., Yale University	
<b>William J. Bowers</b>	<b>Assistant Professor of Sociology and Director of Research Stearns Study</b>
A.B., Washington and Lee University	
<b>Roger F. Brightbill</b>	<b>Assistant Professor of Psychology</b>
B.A., Washington and Jefferson College; Ph.D., Harvard University	
<b>David J. Brudnoy</b>	<b>Assistant Professor of History</b>
B.A., Yale University; A.M., Harvard University	
<b>Lance C. Buhl</b>	<b>Lecturer in History</b>
B.A., Kent State University; A.M., Harvard University	
<b>Lewis G. Bursey</b>	<b>Associate Professor of Political Science</b>
B.A., McGill University; Ph.D., Harvard University	
<b>Conrad P. Caligaris</b>	<b>Assistant Professor of Economics</b>
B.B.A., Clark University; M.A., Ph.D., Brown University	
<b>William E. Cass</b>	<b>Associate Professor of Chemistry</b>
Ph.B., University of Vermont; Ph.D., New York University	
<b>John A. Chandy</b>	<b>Lecturer in Mathematics</b>
B.S., Kerala University; A.M., Ph.D., Boston University	
<b>R. Ernest Clark</b>	<b>Professor of Psychology</b>
B.A., University of New Hampshire; M.A., Ph.D., State University of Iowa	
<b>Rose L. Coser</b>	<b>Associate Professor of Sociology</b>
M.A., Ph.D., Columbia University	
<b>Joseph F. Courtney</b>	<b>Lecturer in Political Science</b>
B.A., Northeastern University; M.A., Boston University	

<b>Alan H. Cromer</b>	<b>Associate Professor of Physics</b>
B.S., University of Wisconsin; Ph.D., Cornell University	
<b>Douglas G. Currie</b>	<b>Assistant Professor of Physics</b>
B.S., Cornell University; Ph.D., University of Rochester	
<b>Philip Davis</b>	<b>Lecturer in Mathematics</b>
B.A., American International College; M.A., Boston University	
<b>Ernest M. DeCicco</b>	<b>Associate Professor of Economics</b>
B.S., M.A., Ph.D., University of New Hampshire	
<b>Eugene DeLuca</b>	<b>Lecturer in Mathematics</b>
B.S., Tufts University; M.S., Massachusetts Institute of Technology	
<b>Beverly C. Dunn</b>	<b>Lecturer in Physics</b>
B.A., M.A., Ph.D., Harvard University	
<b>Michael J. Etel</b>	<b>Assistant Professor of Chemistry</b>
B.S., University of Tennessee; Ph.D., University of Illinois	
<b>David I. Epstein</b>	<b>Associate Professor of Mathematics</b>
B.A., Ph.D., New York University	
<b>George F. Estey</b>	<b>Lecturer in English</b>
B.A., Tufts University; M.A., University of Connecticut; Ph.D., University of Illinois	
<b>Leonard J. Egyes</b>	<b>Lecturer in Physics</b>
B.S., University of Michigan; M.S., Brown University; Ph.D., Cornell University	
<b>Benedetto Fabrizi</b>	<b>Associate Professor of Modern Languages</b>
B.S., Harvard University; M.A., D.M.L., Middlebury College	
<b>Robert A. Feer</b>	<b>Associate Professor of History</b>
B.A., M.A., Ph.D., Harvard University	
<b>Theodore N. Ferdinand</b>	<b>Associate Professor of Sociology</b>
B.S., University of Notre Dame; M.S., Purdue University; Ph.D., University of Michigan	
<b>Frances D. Ferguson</b>	<b>Instructor in Economics</b>
B.A., St. Francis College; M.A., Fordham University	
<b>John D. Ferguson</b>	<b>Assistant Professor of Sociology</b>
B.A., M.A., University of Toronto; Ph.D., Columbia University	
<b>Holland C. Filgo, Jr.</b>	<b>Associate Professor of Mathematics</b>
B.S., Baylor University; M.A., Ph.D., Rice University	
<b>John Frampton</b>	<b>Assistant Professor of Mathematics</b>
B.S., Hofstra College; M.S., Ph.D., Yale University	
<b>Marvin H. Friedman</b>	<b>Professor of Physics</b>
B.S., City College of New York; Ph.D., University of Illinois	

<b>Martha E. Francois</b>	<b>Lecturer in History</b>
A.B., Wells College; A.M., Mount Holyoke College; Ph.D., Harvard University	
<b>Morris Freilich</b>	<b>Associate Professor of Anthropology</b>
B.A., Brooklyn College; Ph.D., Columbia University	
<b>Norbert L. Fullington</b>	<b>Associate Professor of History</b>
B.A., M.A., University of Buffalo; Ph.D., Harvard University	
<b>Charles Gainor</b>	<b>Professor of Biology</b>
B.S., Alfred University; M.S., Maryland University; Ph.D., Michigan State University	
<b>Alberto R. Galmarino</b>	<b>Associate Professor of Mathematics</b>
B.S., University of Buenos Aires; Ph.D., Massachusetts Institute of Technology	
<b>Marvin Gettner</b>	<b>Associate Professor of Physics</b>
B.S., University of Rochester; Ph.D., University of Pennsylvania	
<b>Samuel M. Giveen</b>	<b>Associate Professor of Mathematics</b>
B.A., Bowdoin College; M.A., Harvard University	
<b>Michael J. Glaubman</b>	<b>Associate Professor of Physics</b>
M.S., Hebrew University; Ph.D., University of Illinois	
<b>Merle D. Goldman</b>	<b>Lecturer in History</b>
B.A., Sarah Lawrence College; M.A., Radcliffe College; Ph.D., Harvard University	
<b>Minton F. Goldman</b>	<b>Assistant Professor of Political Science</b>
B.A., College of William and Mary; M.A., Northwestern University	
<b>Harold M. Goldstein</b>	<b>Associate Professor of Economics</b>
B.A., Northeastern University; M.A., Boston College; Ph.D., Clark University	
<b>Charles S. Goolsby</b>	<b>Professor of Biology</b>
B.S., M.S., University of Nebraska; Ph.D., Harvard University	
<b>David Gootkind</b>	<b>Lecturer in Mathematics</b>
B.S., M.S., Massachusetts Institute of Technology	
<b>Daniel Gorenstein</b>	<b>Professor of Mathematics</b>
B.A., M.A., Ph.D., Harvard University	
<b>Bernard Gottschalk</b>	<b>Assistant Professor of Physics</b>
B.S., Rensselaer Polytechnic Institute; M.A., Ph.D., Harvard University	
<b>Marvin J. Greenberg</b>	<b>Associate Professor of Mathematics</b>
B.A., Columbia University; Ph.D., Princeton University	

<b>Joseph D. Gresser</b>	<b>Assistant Professor of Chemistry</b>
B.S., Syracuse University; Ph.D., State University of New York College of Forestry	
<b>Gerald R. Griffin</b>	<b>Instructor in English</b>
B.A., Northeastern University; M.A., Northeastern University	
<b>Arshag B. Hajian</b>	<b>Associate Professor of Mathematics</b>
M.A., University of Chicago; Ph.D., Yale University	
<b>Walter Hauser</b>	<b>Professor of Physics</b>
B.S., Brooklyn College; Ph.D., Massachusetts Institute of Technology	
<b>Elizabeth A. Hartwell</b>	<b>Lecturer in Sociology</b>
A.B., University of Massachusetts; M.A., Brandeis University	
<b>William S. Hellman</b>	<b>Lecturer in Physics</b>
B.S., Brooklyn College; M.S., Ph.D., Syracuse University	
<b>Irwin L. Herrnstadt</b>	<b>Associate Professor of Economics</b>
B.A., Columbia University; Ph.D., Massachusetts Institute of Technology	
<b>Francis B. Hildebrand</b>	<b>Lecturer in Mathematics</b>
B.S., M.A., Washington and Jefferson College; Ph.D., Massachusetts Institute of Technology	
<b>William F. Holton</b>	<b>Associate Professor of Chemistry</b>
B.S., University of Notre Dame; M.S., Miami University; Ph.D., University of Delaware	
<b>Morris A. Horowitz</b>	<b>Professor of Economics and Chairman of the Department</b>
B.S., New York University; Ph.D., Harvard University	
<b>David M. Howell</b>	<b>Associate Professor of Chemistry</b>
B.S., University of California; M.S., Ph.D., University of Michigan	
<b>Victor E. Howes</b>	<b>Professor of English and Chairman of the Department</b>
B.A., Harvard University; M.A., University of Connecticut; Ph.D., Yale University	
<b>Larry D. Hybertson</b>	<b>Lecturer in History</b>
B.A., Eastern Nazarene College; M.A., Ph.D., University of Oregon	
<b>Nagayashi Iwahori</b>	<b>Visiting Professor of Mathematics</b>
Doctor of Science, University of Tokyo	
<b>Conrad M. Jankowski</b>	<b>Associate Professor of Chemistry</b>
B.S., M.S., Michigan State University; Ph.D., State University of Iowa	
<b>Nicolas Johnson</b>	<b>Lecturer in Arts and Sciences</b>
B.S., University of New Hampshire; M.A., Ph.D., Harvard University	

<b>Thomas A. Kaplan</b>	<b>Lecturer in Physics</b>
B.S., Ph.D., University of Pennsylvania	
<b>Barry L. Karger</b>	<b>Assistant Professor of Chemistry</b>
B.S., Massachusetts Institute of Technology; Ph.D., Cornell University	
<b>Charles Karis</b>	<b>Assistant Professor of Psychology</b>
B.A., M.A., Ph.D., Boston University	
<b>I. Norman Katz</b>	<b>Lecturer in Mathematics</b>
B.A., Yeshiva College; M.S., Yeshiva University; Ph.D., Massachusetts Institute of Technology	
<b>John Kazantzis</b>	<b>Assistant Professor of English</b>
A.B., Harvard University; M.A., Ph.D., Boston University	
<b>George Khiralla</b>	<b>Associate Professor of English</b>
B.S., M.A., Boston University	
<b>Robert D. Klein</b>	<b>Associate Professor of Mathematics</b>
B.A., University of Pennsylvania; M.S., Northeastern University	
<b>Walter G. Knabe</b>	<b>Lecturer in Mathematics</b>
Ph.D., University of Vienna	
<b>Ira Kohlberg</b>	<b>Lecturer in Mathematics</b>
B.E.E., City College of New York; M.S., University of Pittsburgh; Ph.D., Boston University	
<b>Elliott A. Krause</b>	<b>Assistant Professor of Sociology</b>
B.A., Harvard University; M.A., Ph.D., Boston University	
<b>Reginald G. Lacount</b>	<b>Professor of Physics and Chairman of the Department</b>
B.S., M.S., Ph.D., Boston University	
<b>David Lamensdorf</b>	<b>Lecturer in Mathematics</b>
B.S., Cornell University; M.S., Ph.D., Harvard University	
<b>Giovanni Lanza</b>	<b>Professor of Physics</b>
Ph.D., University of Trieste	
<b>Frank F. Lee</b>	<b>Professor of Sociology and Chairman of the Department</b>
B.A., M.A., Ph.D., Yale University	
<b>Carlton G. Lehr</b>	<b>Lecturer in Mathematics</b>
B.S., M.S., Massachusetts Institute of Technology	
<b>Richard H. Lent</b>	<b>Assistant Professor of Psychology</b>
B.A., Tufts University; M.A., Columbia University; Ph.D., Harvard University	
<b>Leonard Lesensky</b>	<b>Lecturer in Mathematics</b>
B.A., Brooklyn College; M.A., Ph.D., Columbia University	

<b>Irving Lessin</b>	<b>Lecturer in Physics</b>
B.A., Brooklyn College; Ph.D., New York University	
<b>George Leung</b>	<b>Assistant Professor of Physics</b>
B.S., George Washington University; M.S., Ph.D., Massachusetts Institute of Technology	
<b>Elliott H. Lieb</b>	<b>Professor of Physics</b>
B.S., Massachusetts Institute of Technology; Ph.D., University of Birmingham	
<b>Francis D. Lonergan</b>	<b>Lecturer in Mathematics</b>
A.B., Holy Cross College; M.A., Florida State University	
<b>Joseph D. Lordan</b>	<b>Lecturer in Mathematics</b>
B.S., Massachusetts Institute of Technology	
<b>Ward C. Low</b>	<b>Lecturer in Mathematics</b>
B.S., University of Wyoming; Ph.D., Boston University	
<b>Ivory L. Lyons</b>	<b>Associate Professor of Economics</b>
B.A., Morehouse College; M.A., Ph.D., Harvard University	
<b>Robert MacDonald</b>	<b>Assistant Professor of History</b>
B.A., Boston University; M.A., University of Chicago	
<b>Helen S. Mahut</b>	<b>Associate Professor of Psychology</b>
B.A., Sir George Williams University; M.A., Ph.D., McGill University	
<b>Bertram J. Malenka</b>	<b>Professor of Physics</b>
B.A., Columbia University; M.A., Ph.D., Harvard University	
<b>Charles J. Martin</b>	<b>Lecturer in Mathematics</b>
B.S., Union College; M.S., Michigan State University; Ph.D., Rensselaer Polytechnic Institute	
<b>John H. Martin</b>	<b>Assistant Professor of English</b>
B.A., Northeastern University; M.A., University of Connecticut; Ph.D., Syracuse University	
<b>Lois B. Merk</b>	<b>Lecturer in History</b>
A.B., Smith College; A.M., Clark University; Ph.D., Radcliffe College	
<b>James Misho</b>	<b>Lecturer in Mathematics</b>
B.S., Boston University; A.M., Harvard University	
<b>I. Larry Morris</b>	<b>Lecturer in Mathematics</b>
M.E., Stevens Institute of Technology; S.M.E.E., Massachusetts Institute of Technology; Ph.D., Harvard University	
<b>Samuel F. Morse</b>	<b>Associate Professor of English</b>
B.A., Dartmouth College; M.A., Harvard University; Ph.D., Boston University	

<b>Samuel Moyer</b>	<b>Assistant Professor of Biology</b>
B.S., Pennsylvania State University; M.S., University of New Hampshire; Ph.D., University of Minnesota	
<b>Charles R. Mullin</b>	<b>Lecturer in Mathematics</b>
B.S., St. Lawrence University; M.S., Cornell University	
<b>John M. Myers</b>	<b>Lecturer in Mathematics</b>
B.S., California Institute of Technology; Ph.D., Harvard University	
<b>Harold Naidus</b>	<b>Associate Professor of Chemistry</b>
B.A., M.S., University of Illinois; Ph.D., Polytechnic Institute of Brooklyn	
<b>Pran Nath</b>	<b>Assistant Professor of Physics</b>
B.S., M.S., University of Delhi; Ph.D., Stanford University	
<b>Daniel Ounjian</b>	<b>Lecturer in Economics</b>
A.B., Tufts University; Ph.D., Harvard University	
<b>Joseph V. Pearincott</b>	<b>Assistant Professor of Biology</b>
B.S., Saint Berchmans' College; M.S., Aligarh University; Ph.D., Fordham University	
<b>Peter J. Philliou</b>	<b>Lecturer in Mathematics</b>
B.S., Massachusetts Institute of Technology; M.S., Columbia University; M.S., Polytechnic Institute of Brooklyn	
<b>Ernest E. Pittelli</b>	<b>Lecturer in Physics</b>
B.S., Villanova University; Ph.D., University of Pennsylvania	
<b>Valentin Poenaru</b>	<b>Professor of Mathematics</b>
Dr.Sci., University of Paris	
<b>John F. Reinhard</b>	<b>Professor of Pharmacology and Chairman of the Department</b>
B.S., M.S., Ph.D., New York University	
<b>Flavio B. Reis</b>	<b>Professor of Mathematics</b>
B.S., Escola Politecnica, Rio de Janeiro; M.S., Ph.D., Massachusetts Institute of Technology	
<b>Nathan W. Riser</b>	<b>Professor of Biology and Director of the Marine Institute</b>
B.A., University of Illinois; M.A., Ph.D., Stanford University	
<b>Martin L. Robbins</b>	<b>Lecturer in English</b>
B.A., University of Colorado; M.S., State University of Iowa	
<b>Louis E. Roberts</b>	<b>Lecturer in English</b>
A.B., Bowdoin; M.A., Boston University	
<b>Raymond H. Robinson</b>	<b>Professor of History and Chairman of the Department</b>
B.A., M.A., Pennsylvania State College; Ph.D., Harvard University	

<b>John L. Roeber</b>	<b>Associate Professor of Chemistry</b>
B.A., Washington University; Ph.D., University of California	
<b>Fred A. Rosenberg</b>	<b>Assistant Professor of Biology</b>
B.A., New York University; Ph.D., Rutgers University	
<b>Lawrence Rosenfeld</b>	<b>Lecturer in Mathematics</b>
B.S., Queens College; M.A., Ph.D., Harvard University	
<b>Harry A. Rothmann</b>	<b>Lecturer in Mathematics</b>
B.S., McMaster University; M.S., Massachusetts Institute of Technology	
<b>Prabuddha N. Roy</b>	<b>Assistant Professor of Economics</b>
B.A., Presidency College; M.A., Calcutta University	
<b>Morton Rubin</b>	<b>Associate Professor of Sociology</b>
B.A., Boston University; M.A., Ph.D., University of North Carolina	
<b>Eugene J. Saletan</b>	<b>Associate Professor of Physics</b>
B.A., Brooklyn College; M.A., Ph.D., Princeton University	
<b>Ina Samuels</b>	<b>Assistant Professor of Psychology</b>
Ph.B., University of Chicago; B.A., University of California at Los Angeles; M.A., Ph.D., University of Michigan	
<b>Gustav Schachter</b>	<b>Associate Professor of Economics</b>
B.S., City College of New York; M.S., Ph.D., New York University	
<b>Stephen Schafer</b>	<b>Professor of Sociology and Criminology</b>
Ph.D., University of Budapest	
<b>Bertram Scharf</b>	<b>Associate Professor of Psychology</b>
B.A., City College of New York; Ph.D., Harvard University	
<b>Dale R. Schissler</b>	<b>Assistant Professor of Psychology</b>
B.S., Pennsylvania State University; Ph.D., University of Chicago	
<b>Yitzhak Sharon</b>	<b>Assistant Professor of Physics</b>
A.B., Columbia University; M.A., Ph.D., Princeton University	
<b>Donald Shelby</b>	<b>Professor of Economics</b>
B.A., University of Cincinnati; Ph.D., University of California at Berkeley	
<b>Robert A. Shepard</b>	<b>Professor of Chemistry and Chairman of the Department</b>
B.S., Ph.D., Yale University	
<b>Hassell B. Sledd</b>	<b>Assistant Professor of English</b>
B.A., M.A., University of North Carolina	
<b>Albert H. Soloway</b>	<b>Associate Professor of Medicinal Chemistry</b>
B.S., Worcester Polytechnic Institute; Ph.D., University of Rochester	

<b>Giuliano Sorani</b>	<b>Associate Professor of Mathematics</b>
Laurea, University of Rome	
<b>Robert C. Sprich</b>	<b>Lecturer in English</b>
B.S., Massachusetts Institute of Technology; M.A., Brandeis University	
<b>Yogi Srivastava</b>	<b>Assistant Professor of Physics</b>
B.S., St. Andrews College; M.S., University of Gorakhpur; Ph.D., Indiana University	
<b>John J. Stachel</b>	<b>Lecturer in Physics</b>
B.S., City College of New York; M.S., Ph.D., Stevens Institute of Technology	
<b>Victor R. Staknis</b>	<b>Associate Professor of Mathematics</b>
B.S., State College at Bridgewater; B.S., Massachusetts Institute of Technology; M.A., Ph.D., Boston University	
<b>Stanley Stembridge</b>	<b>Associate Professor of History</b>
B.A., Boston University; M.A., Ph.D., Harvard University	
<b>Robert L. Stern</b>	<b>Associate Professor of Chemistry</b>
B.A., Oberlin College; M.A., Ph.D., Johns Hopkins University	
<b>William J. Strong</b>	<b>Lecturer in Physics</b>
B.S., M.S., Brigham Young University; Ph.D., Massachusetts Institute of Technology	
<b>Warren H. Teichner</b>	<b>Professor of Psychology</b>
B.A., M.S., University of Oklahoma; Ph.D., University of Iowa	
<b>Rocco Urbano</b>	<b>Lecturer in Mathematics</b>
B.A., Union College; M.A., Harvard University	
<b>Michael T. Vaughn</b>	<b>Associate Professor of Physics</b>
B.A., Columbia University; Ph.D., Purdue University	
<b>Alfred Viola</b>	<b>Associate Professor of Chemistry</b>
B.A., M.A., Johns Hopkins University; Ph.D., University of Maryland	
<b>Hans Von Briesen, Jr.</b>	<b>Assistant Professor of Physics</b>
B.S., Stanford University; Ph.D., University of Rochester	
<b>Eberhard VonGoeler</b>	<b>Assistant Professor of Physics</b>
M.S., Ph.D., University of Illinois	
<b>Jack Warga</b>	<b>Professor of Mathematics</b>
B.A., Carleton College; Ph.D., New York University	
<b>A. Bertrand Warren</b>	<b>Professor of Psychology and Chairman of the Department</b>
B.A., M.A., Ph.D., Clark University	

<b>Neal T. Watson</b>	<b>Lecturer in Mathematics</b>
B.A., Duke University; M.A., Harvard University	
<b>David M. Waxman</b>	<b>Lecturer in Mathematics</b>
B.A., M.S., New York University	
<b>Israel J. Weinberg</b>	<b>Lecturer in Mathematics</b>
B.A., Yeshiva College; S.M., Ph.D., Massachusetts Institute of Technology	
<b>Roy Weinstein</b>	<b>Professor of Physics</b>
S.B., Ph.D., Massachusetts Institute of Technology	
<b>Karl H. Weiss</b>	<b>Professor of Chemistry</b>
B. S., Columbia University; Ph.D., New York University	
<b>Morton S. Weiss</b>	<b>Assistant Professor of Physics</b>
B.S., Rensselaer Polytechnic Institute; Ph.D., Massachusetts Institute of Technology	
<b>Sarah Wernick</b>	<b>Instructor in Sociology</b>
B.A., Barnard College	
<b>Henry O. Werntz</b>	<b>Associate Professor of Biology and Acting Chairman of the Department</b>
B.S., Rutgers University; Ph.D., Yale University	
<b>Roger E. Wiehe</b>	<b>Lecturer in English</b>
B.A., Yale University; M.A., University of Illinois; Ph.D., Columbia University	
<b>Robert N. Wiener</b>	<b>Associate Professor of Chemistry</b>
B.A., Harvard University; M.S., Ph.D., University of Pennsylvania	
<b>R. Gregg Wilfong</b>	<b>Professor of Political Science and Chairman of the Department</b>
B.A., M.A., University of Texas; M.A., Ph.D., Harvard University	
<b>Arthur W. Winston</b>	<b>Lecturer in Physics</b>
B.A., University of Toronto; Ph.D., Massachusetts Institute of Technology	
<b>Steve Worth</b>	<b>Associate Professor of Political Science</b>
B.S., University of Oregon; Ph.D., University of Washington	
<b>Husseyin Yilmaz</b>	<b>Adjunct Professor of Physics</b>
B.S., M.S., Technical University; Ph.D., Massachusetts Institute of Technology	
<b>Harold S. Zamansky</b>	<b>Professor of Psychology</b>
B.S., Tufts University; Ph.D., Harvard University	
<b>Manuel Zymelman</b>	<b>Associate Professor of Economics</b>
Degree in Engineering, University of Buenos Aires; M.S., Ph.D., Massachusetts Institute of Technology	

*Fields  
of  
Study*



# Biology

## THE MASTER'S DEGREE

### Full-Time Program

#### Admission

To be enrolled for graduate work in biology leading to the Master of Science Degree, applicants must have obtained a bachelor's degree from a recognized institution, with an undergraduate program normally including one year of organic chemistry, physics, and mathematics and six quarter courses or the equivalent in biological sciences beyond the elementary level. Students admitted with deficiencies should remove them during the first year of graduate work by courses whose credit will not be counted toward the Master's requirements. Applicants for the Master's program should apply to the Departmental Graduate Committee by March 15.

#### Program

Forty quarter hours of academic work are required. This work must include courses of the core program: one year of botany, zoology, and physiology and one course each in genetics, microbiology, and ecology. With approval of the Graduate Committee, advanced undergraduate courses, including those taken previously at other institutions, may be used to satisfy core requirements. A seminar during each quarter of registration is required. At least 20 quarter hours of credit must be taken in graduate biology courses in addition to the required seminars. Work may be taken from other departments as approved by the student's adviser.

Each student must enroll for six to twelve credits of work in 18.991, Research for the Master's Degree. The work done in this course may at the student's option be expanded into a Master's thesis with a topic and advisor approved by the graduate committee. A comprehensive examination in the last six months of the Master's program is required of all students, except those presenting a thesis. For the latter a final oral examination on the thesis is required.

## THE MASTER OF SCIENCE IN HEALTH SCIENCE

### Part-Time Evening Program

#### Admission

To be enrolled for graduate work in biology leading to the degree of Master of Science in Health Science, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least 15 semester hours of science courses. In particular, this work must include a course in general biology or a course in botany and one in general zoology, one year of general chemistry, and one year of organic chemistry.

## Program

The program leading to the degree of Master of Science in Health Science is designed for part-time evening students who may progress according to their abilities and time available. Forty quarter hour credits of academic work are required. The requirements may be met by taking the courses at the time at which they are offered. With the approval of the departmental graduate committee, a thesis may be elected for nine quarter hour credits.

## THE DOCTOR'S PROGRAM

### Admission

Applications should be sent to the Biology Department Graduate Committee. Applicants who will have a Master's degree or its equivalent at entry may be considered for direct admission to the doctoral program. Those who will not may be considered only for admission to the Master's program, and, after satisfactory completion of 30 quarter hours of graduate study, may then be considered for admission to the doctoral program.

Students enrolled at Northeastern University must submit transcripts of their undergraduate and graduate work which has been completed. Students enrolled at other institutions must submit three letters of recommendation and their Graduate Record Examination scores in addition to the necessary transcripts. The applicant should make clear the specific area of his research interest. If favorable action is taken, admission will be contingent upon the satisfactory completion of the course work in progress at the school in which the applicant is enrolled.

### Residence Requirement

The residence requirement after being admitted to doctoral candidacy is satisfied by one year of full-time graduate work or by two years of half-time graduate work. However, a student should expect to spend at least two years or the equivalent in full-time study.

### Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division Regulations.

### Qualifying Examination

Students entering the doctoral program will be expected to have had the core program or its equivalent before taking their qualifying examination. Students who have been accepted directly into the doctoral program from another institution will normally be expected to complete the qualifying examination during their first year at Northeastern University at a time specified by the Departmental Graduate Committee. Five fields of the core program are to be covered in the qualifying examination of each candidate.

and the examination will be announced by the Departmental Graduate Committee at least two months before the examination is given. Failed examinations may be repeated once after the lapse of one quarter but not later than the end of the second quarter following the failure. Eligibility to continue the program toward the Doctor of Philosophy degree is contingent upon satisfactory performance on the qualifying examinations.

### **Comprehensive Examination**

The comprehensive examination requirement will be fulfilled by two written examinations, one in the major area of specialization and the other in closely related areas. The candidate may apply through his adviser after completing one of the foreign language requirements and at least one quarter prior to the oral examination.

### **Course Requirements**

After the establishment of candidacy, any further course requirements will be established by the thesis adviser and approved by the Graduate Committee.

### **Thesis**

In most cases, arrangements for a thesis adviser will have been made before the completion of the qualifying examinations. If not, such arrangements must be made as soon as possible after degree candidacy has been established. The thesis adviser directs the research for the thesis and serves as chairman of the thesis committee, which must approve the thesis before the degree may be conferred.

### **Language Requirement**

Ability to read and translate biological literature in two foreign languages must be established by the candidate. In order to maximize the usefulness of these languages in his training the student should take these examinations as early as possible. The examinations will be administered by the Department of Biology, or in certain cases, by the Language Department. French, German, and Russian are the three most important foreign languages for the biologist. Students will be expected to choose two of these languages for their examinations, but another language may be substituted for one where there is a significant literature in the area of interest.

### **Final Oral Examination**

This examination will be held in accordance with the General Regulations of the Graduate Division.

## DESCRIPTION OF COURSES

All courses carry four quarter hours of credit unless otherwise specified.

### **18.801 Dynamics of Ecology**

Chemical, physical, and biotic factors influencing plant and animal communities.

### **18.802 Physiological Chemistry**

Intermediary metabolism and nutrition.

### **18.803 Biometrics**

Statistical methods applied to biological samples and analysis of biological research data.

### **18.804 Lower Invertebrates**

Taxonomy, morphology, embryology, and life histories of acelomate phyla. (Offered Summer quarter, at Nahant)

### **18.805 Coelomate Invertebrates**

Continuation of 18.804. (Offered Summer quarter, at Nahant)

### **18.806 Malacology**

Functional morphology, embryology, systematics and ecology of the major groups of mollusks.

### **18.807 Parasitology**

Symbiotic relationships of protozoans, mesozoans, flatworms, nematodes, acanthocephalans, and arthropods.

### **18.808 Protozoology**

Survey of parasitic and free-living protozoa.

### **18.809 Helminthology**

Survey of parasitic helminths.

### **18.810 Ichthyology**

Natural history and systematics of fishes, with emphasis on marine species. (Offered Summer quarter, at Nahant)

### **18.815 Nuclear Instrumentation**

Fundamentals of nuclear radiation and instrumentation for its detection. Credits: 2 quarter hours.

### **18.817 Tissue Pathology**

Microscopic analysis of pathological animal tissues.

### **18.818 Cytology**

Classical and modern techniques for the study of the cell.

### **18.819 Principles of Systematics**

**18.820 Lower Plants**

Systematic morphology and life cycles of Monera and plant-like Protista.

**18.821 Higher Plants**

Systematic morphology of the Metaphyta.

**18.822 Systematic Botany**

Classification and nomenclature of plants.

**18.824 Plant Anatomy**

Structure of vascular plants presented from the viewpoint of ontogeny.

**18.825 Plant Physiology**

Prep. Basic Botany

Plant nutrition and mineral deficiencies. Translocation. Transpiration and water relations. Enzymes and respiration. Photosynthesis and metabolism in plants.

**18.826 Plant Growth and Reproduction**

Prep. Basic Botany

Growth and differentiation of plant tissues. Auxins and plant growth. Photoperiodism and vernalization. Environment and radiation.

**18.830 Marine Algae**

Systematics, life histories, and ecology of marine algae, with emphasis on the flora of the Gulf of Maine. (Offered Summer quarter, at Nahant)

**18.835 Mammalian Physiology**

Structural and biochemical aspect of mammalian cells. Bioelectric phenomena. Muscle and nerve function. Physiology of digestive, cardiovascular and respiratory system. Kidney and its functions. Reproductive physiology and endocrine system.

**18.840 Comparative Physiology of Regulatory Mechanisms**

Prep. Basic Physiology

Principles and selected examples of physiological response to environmental variation.

Credits: 2 quarter hours.

**18.842 Vertebrate Endocrinology**

Regulation of physiologic processes in vertebrates by hormones and related substances.

**18.843 Procedures in Endocrinology**

Credits: 3 quarter hours.

**18.850 Population Genetics**

Prep. Basic Genetics

Mendel's laws and principles of genotype dynamics in populations of organisms. Mechanisms of evolution.

**18.851 Cytogenetics** Prep. Basic Genetics  
Classical and contemporary topics of cytogenetics in plant and animal material, including human.

**18.855 Insect Metabolism**  
Food consumption and intermediary metabolism in insects.  
Credits: 2 quarter hours.

**18.901 Serology-Immunology** Prep. Basic Microbiology  
Current concepts concerning specific and non-specific factors or resistance to microbial disease. Chemical and biological considerations of antigens and antibodies. Laboratory work includes agglutination, precipitin, and agar diffusion tests. Quantitative approaches stressed.

**18.902 Medical Mycology**  
The biology of organisms responsible for mycosis; chemical, epidemiological, and histopathological topics and techniques.

**18.903 Environmental Microbiology** Prep. Basic Microbiology  
The microbial environment and ecology of the cell. Interactions between microbial populations, stressing soil and fresh-water associations.

**18.904 Medical Microbiology** Prep. Basic Microbiology  
The bacterial cell as a pathogen, stressing major genera of disease-producing organisms and factors influencing virulence.

**18.905 Marine Microbiology**  
Morphological, physiological, and ecological factors concerning marine micro-organisms. Taxonomic problems, microbial association, and general methodological approaches to the study of marine micro-organisms.

**18.980 Seminar**  
Credit: 1 quarter hour.

**18.990 Special Topics in Biology** Prep. Consent of Graduate Committee  
Special study of a selected topic under direction of a faculty member.  
Credits: to be arranged.

**18.991 Research and Thesis for M.S.**  
Research methods of some special field and their application to a specific problem, under direction of a faculty member.  
Credits: to be arranged.

**18.995 Research and Thesis for Ph.D.** Prep. Ph.D. candidacy  
Original research in depth, representing a significant contribution of new biological knowledge, and a written thesis thereon, under the supervision of a faculty member.  
(Offered yearly, every quarter)

# *Chemistry*

## Admission

To be enrolled for graduate work in chemistry as a regular student, a student must have a bachelor's degree from a recognized institution and must have satisfactorily completed a curriculum of not less than four full-year chemistry courses of the level required of an undergraduate major in chemistry. These must include organic, physical, and analytical chemistry. Admission policy favors those who have taken more chemistry than these minima. In addition, one year each of college physics and calculus are required, and further work in these subjects is desirable.

## THE MASTER'S DEGREE

### Full-Time Program

The normal full-time program consists of courses, seminars, research, and a thesis thereon. Each student is required to take 12.801, Introduction to Research I, and 12.802, Introduction to Research II, and at least two courses, four quarters hours of credit, in each of the four major fields of Analytical, Inorganic, Organic, and Physical Chemistry. No more than 12 credit hours may be assigned to 12.991, Research and Thesis for the Master of Science degree, and no more than four credit hours to 12.990, Seminar. Each student is required to attend 12.990, Seminar, in each term. One credit is assigned to a student for each term in which he conducts a seminar, up to the maximum of four credits.

### Part-Time Evening Program

The admission requirements for this program are the same as for the full-time program, but course requirements differ, and students may progress according to their abilities and the time available.

The following are required courses in the part-time program:

	Credits
12.821	Analytical Separations .....
12.822	Electroanalytical Chemistry .....
12.823	Optical Methods of Analysis .....
12.841-843	Advanced Inorganic Chemistry .....
12.861-862	Advanced Organic Chemistry .....
12.863	Theoretical Organic Chemistry .....
12.881-882	Thermodynamics .....
12.885-886	Atomic and Molecular Structure .....
	<u>26</u>

### **Electives**

Six additional credits must be taken in graduate chemistry courses. The remaining eight credits may be taken in any graduate courses in chemistry, mathematics, engineering, or physics for which the student has the necessary preparation.

## **THE DOCTOR OF PHILOSOPHY DEGREE**

The doctoral program in chemistry is a logical extension of the master's program, but it may be pursued only in residence. The additional requirements beyond those of the master's degree are designed to demonstrate superior proficiency in original research, including technical reading ability in two foreign languages and familiarity with current advances in one of the four main divisions of chemistry. Any student who wishes to pursue the doctorate must petition the Department for acceptance in the doctoral program. If accepted, a student is considered to be in the doctoral program as soon as he begins taking the doctoral qualifying examination and takes up full-time residence.

### **Residence Requirement**

The residence requirement is satisfied after one year of full-time graduate work or two years of half-time work; however, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary to complete the doctoral degree requirements. If a student holds a teaching assistantship which occupies one half of his time, his residence requirement is being discharged at half rate. No other part-time arrangements are permitted. If a candidate has a research fellowship which supports his research for the doctoral thesis, his residence requirement is discharged at a full rate.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general Graduate Division regulations.

### **Qualifying Examination**

The qualifying examination consists of four parts, offered separately, covering the fields of analytical, inorganic, organic and physical chemistry. These examinations are scheduled in early September, in mid-winter, and in late June. Passing the series requires: (a) a passing grade, C or better, in each field; (b) a B average or better for all four fields; (c) a B or better in the student's field of specialization; and (d) completion of the series within 18 months of beginning full-time graduate study (i.e. within the first 4 consecutive offerings of the examinations). The examination in any one field may be repeated only once.

A person not in the full-time graduate program may petition the department for permission to take the qualifying examinations. If permission is granted, such a person must complete the examinations within a period of 13 months (i.e. within 4 consecutive offerings of the examinations). If he does so successfully, he must apply immediately for admission to full-time doctoral study within the next 12 months.

### **Comprehensive Examination**

The comprehensive examination requirement is composed of a series of short written examinations in the candidate's field of specialization. These are offered monthly and are designed to test the candidate's familiarity with the current research frontiers of his specialty.

Within two years after degree candidacy has been established, a student must have passed seven of these examinations before he fails seven.

### **Course Requirements**

A candidate is normally required by his faculty adviser to do some course work beyond the 40 quarter hour minimum. The number and nature of these courses are individually determined for each candidate.

### **Thesis**

In most cases, arrangements for a thesis adviser will have been made before the completion of the qualifying examinations. If not, such arrangements must be made as soon as possible after degree candidacy has been established. The thesis adviser directs the research for the thesis and serves as chairman of the thesis committee, which must approve the thesis before the degree may be conferred.

### **Language Requirement**

Proficiency must be demonstrated in two foreign languages as specified by the departmental graduate committee in accordance with the general Graduate Division regulations. French, German, and Russian are the acceptable foreign languages. Normally, proficiency is demonstrated by taking examinations administered by the Chemistry Department.

### **Final Oral Examination**

This examination will be held in accordance with the Graduate Division regulations.

## DESCRIPTION OF COURSES

All courses carry two quarter hours of credit except seminar and research.

**12.801 Introduction to Research I**      Prep. Admission to the graduate program in chemistry

A demonstration and laboratory course to introduce the student to general research techniques. Problems will be assigned in glassblowing, chemical literature, and instrumental measurements. Laboratory projects directed by the graduate faculty are included.

(Offered yearly, Fall quarter)

**12.802 Introduction to Research II**      Prep. 12.801, Introduction to Research I

Laboratory projects are assigned, which are directed by the members of the graduate faculty, and which demonstrate and utilize the specialized research techniques in the student's major area of interest.

(Offered yearly, Winter quarter)

**12.821 Analytical Separations**      Prep. Admission to the graduate program in chemistry

The theory and practice of analytical separation techniques. Topics will include distillation, liquid-liquid extraction, various types of chromatography, and other techniques.

(Offered yearly, Fall quarter)

**12.822 Electroanalytical Chemistry**      Prep. Admission to the graduate program in chemistry

The principles and practice of electrometric methods of analysis. Topics of discussion will include: electrogravimetry, coulometry, polarography, chrono-potentiometry, and pH measurements. An extensive discussion of titration end-point detection systems will include: potentiometric, conductometric, amperometric and high frequency methods.

(Offered yearly, Winter quarter)

**12.823 Optical Methods of Analysis**      Prep. Admission to the graduate program in chemistry

The theory and practice of traditional and recent optical methods of analysis. Topics will include infrared, ultraviolet and visible analytical spectroscopy as well as such techniques as flame emission and atomic absorption spectroscopy. Nuclear magnetic resonance, electron spin resonance, and mass spectroscopy will also be discussed.

(Offered yearly, Spring quarter)

**12.824 Special Topics in Analytical Chemistry I**      Prep. Admission to the graduate program in chemistry

Selected topics of current importance in analytical chemistry.

(Offered yearly, Fall quarter)

**12.825 Special Topics in Analytical Chemistry II**      Prep. 12.821 or permission of instructor

In 1967-68 the course will be an extensive study of gas-liquid and gas-solid chromatography. (1) The theory of chromatography as it applies to these two techniques will be developed. (2) Instrumentation necessary for successful operation of a gas chromatograph will be discussed. (3) Newer developments such as support coated open tubular columns, reaction gas chromatography, and continuous large scale chromatography will be presented.

(Offered yearly, Winter quarter)

**12.826 Special Topics in Analytical Chemistry III**      Prep. Admission to the graduate program in chemistry

Selected topics of current importance in analytical chemistry.

(Offered yearly, Spring quarter)

**12.841 Advanced Inorganic Chemistry I**      Prep. One year physical chemistry

Characteristics of atoms and molecules based on their electronic structure and the periodic classification of elements. Structure of crystals. Electrostatic complexes. Advanced chemistry of lighter elements.

(Offered yearly, Fall quarter — day and evening,  
Winter quarter — day only)**12.842 Advanced Inorganic Chemistry II**      Prep. 12.841, Advanced Inorganic Chemistry I

Advanced treatment of the chemistry of transition metals; acid and base behavior. The significance of nuclear properties, nuclear changes and tracer studies in inorganic chemistry is an integral part of the course.

(Offered yearly, Winter quarter — evening only,  
Spring quarter — day only)**12.843 Advanced Inorganic Chemistry III**      Prep. 12.842, Advanced Inorganic Chemistry II

Equilibrium properties of complex ions. Elementary inorganic reaction stereochemistry. Crystal symmetry properties. The solid state from a chemical point of view. Semiconductors, metals, alloys, non-stoichiometric compounds. Chemistry of the heavier non-transition elements. Lanthanides and actinides. (Offered yearly, Spring quarter — evening)

**12.844 Radiochemistry I**      Prep. Admission to the graduate program in chemistry

Nuclear reactions, the interaction of matter with high-energy radiation, detection of radiation and the statistics of radioactive counting. An introduction to the use of radioactive tracers in chemical research.

(Offered 1967-68, Fall quarter)

**12.845 Radiochemistry II**      Prep. 12.844, Radiochemistry I  
A continuation of 12.844.      (Offered 1967-68, Winter quarter)

<b>12.846 Coordination Chemistry</b>	Prep. 12.843, Advanced Inorganic Chemistry III Coordination compounds: their experimental detection, calculation of stability constants, factors affecting solubility and stability constants. Ligand field theory. Acidity, color, and lability of complexes, Kinetic and stereochemical studies of inorganic reaction mechanisms. (Offered 1968–69, Spring quarter)
<b>12.847 Special Topics in Inorganic Chemistry</b>	Prep. 12.842, Advanced Inorganic Chemistry II and consent of instructor Selected topics of current importance in inorganic chemistry such as non-stoichiometric compounds, geochemistry, fused salt chemistry, ion exchange resins, chemistry of transition elements. (Offered 1968–69, Fall quarter)
<b>12.861 Advanced Organic Chemistry I</b>	Prep. One year of organic chemistry An intensive survey of organic reactions. Modern concepts of structure and mechanism are used to correlate factual material. (Offered yearly, Fall quarter)
<b>12.862 Advanced Organic Chemistry II</b>	Prep. 12.862, Advanced Organic Chemistry I A continuation of 12.861. (Offered yearly, Winter quarter)
<b>12.863 Theoretical Organic Chemistry</b>	Prep. 12.862, Advanced Organic Chemistry II Inductive, resonance and steric effects on reactivity and properties of organic molecules. Theory of organic acids and bases. Introduction to the study of organic reaction mechanisms. (Offered yearly, Spring quarter)
<b>12.864 Stereochemistry I</b>	Prep. 12.862, Advanced Organic Chemistry II Geometrical and optical isomerism in organic compounds; conformational analysis. (Offered 1968–69, Fall quarter)
<b>12.865 Stereochemistry II</b>	Prep. 12.864, Stereochemistry I Continuation of 12.864. (Offered 1968–69, Winter quarter)
<b>12.867 Natural Products I</b>	Prep. 12.862, Advanced Organic Chemistry II Isolation, structure determination, synthesis and transformations of selected classes of organic compounds of biological interest. Lipids, carbohydrates, amino acids and proteins. (Offered 1968–69, Fall quarter)

**12.868 Natural Products II** Prep. 12.867, Natural Products I  
Continuation of 12.867. Glycosides, antibiotics, vitamins, alkaloids.  
(Offered 1968–69, Winter quarter)

**12.869 Natural Products III** Prep. 12.868, Natural Products II  
Continuation of 12.868. Steroids.  
(Offered 1968–69, Spring quarter)

**12.871 Special Topics in Organic Chemistry I** Prep. 12.862, Advanced  
Organic Chemistry II and  
consent of instructor  
Selected topics of current importance in organic chemistry.  
(Offered 1967–68, Fall quarter)

**12.872 Special Topics in Organic Chemistry II** Prep. 12.862,  
Advanced Organic Chemistry II  
and consent of instructor  
Selected topics of current importance in organic chemistry.  
(Offered 1968–69, Winter quarter)

**12.873 Special Topics in Organic Chemistry III** Prep. 12.862,  
Advanced Organic Chemistry II  
and consent of instructor  
Selected topics of current importance in organic chemistry.  
(Offered 1967–68, Spring quarter)

**12.876 Mechanisms of Organic Reactions I** Prep. Theoretical  
organic chemistry and  
12.865, Stereochemistry II  
Consideration of the fundamental factors influencing the course of a  
chemical reaction. Study of the effects of structural and environmental  
changes on mechanisms of organic reactions.  
(Offered 1968–69, Spring quarter)

**12.877 Mechanisms of Organic Reactions II** Prep. 12.876,  
Mechanisms of Organic Reactions I  
Continuation of 12.876.  
(Offered 1967–68, Fall quarter)

**12.878 Physical Techniques of Organic Chemistry I** Prep. 12.862,  
Advanced Organic Chemistry II  
Correlation of structures of organic compounds with their physical  
properties: gross physical properties, dipole moments, absorption and  
Raman spectra, electron and X-ray diffraction, nuclear magnetic res-  
onance, optical rotatory dispersion, mass spectrometry.  
(Offered 1967–68, Winter quarter)

**12.879 Physical Techniques of Organic Chemistry II** Prep. 12.878,  
Physical Techniques of Organic Chemistry I  
Continuation of 12.878.  
(Offered 1967–68, Spring quarter)

**12.881 Thermodynamics I** Prep. One year of physical chemistry  
First Law of Thermodynamics, Thermochemistry, Second and Third Laws,  
Equilibrium. (Offered yearly, Fall quarter)

**12.882 Thermodynamics II** Prep. 12.881, Thermodynamics I  
Partial Molar Properties, Mixtures, E.M.F.  
(Offered yearly, Winter quarter)

**12.885 Atomic and Molecular Structure I** Prep. One year of  
physical chemistry  
Introduction to Wave Mechanics, Atomic Structure, Spectroscopy.  
(Offered yearly, Winter quarter)

**12.886 Atomic and Molecular Structure II** Prep. 12.885, Atomic and  
Molecular Structure I  
The Chemical Bond, diatomic molecules, polyatomic molecules.  
(Offered yearly, Spring quarter)

**12.888 Colloid Chemistry I** Prep. One year of physical chemistry  
An introduction to the physical chemistry of surfaces and of colloidal  
systems. Among the topics to be discussed will be colligative properties  
of colloidal systems, statistical equilibrium, sedimentation, diffusion,  
and absorption. (Offered 1967-68, Winter quarter)

**12.889 Colloid Chemistry II** Prep. 12.888, Colloid Chemistry I  
Continuation of 12.888, considering the theory of light scattering, the  
rheology of colloidal systems, chromatographic methods, and electro-  
kinetic phenomena. (Offered 1967-68, Spring quarter)

**12.891 Special Topics in Physical Chemistry** Prep. Consent of instructor  
Selected topics of current importance in physical chemistry.  
(Offered 1968-69, Fall quarter)

**12.893 Kinetics and Statistical Thermodynamics I** Prep. 12.882,  
Thermodynamics II and 12.885, Atomic and  
Molecular Structure I  
Maxwell-Boltzmann statistics, quantum statistics, partition functions,  
and thermodynamic properties. Experimental aspects of reaction kinetics.  
(Offered yearly, Spring quarter)

**12.894 Kinetics and Statistical Thermodynamics II** Prep. 12.893,  
Kinetics and Statistical Thermodynamics I  
Collision and transition state theories of reaction rates. Application of  
statistical thermodynamics. Reaction velocity in solution. Catalysis, chain  
reaction, isotope effects, and photochemistry.  
(Offered yearly, Fall quarter)

**12.895 Statistical Mechanics I** Prep. 12.894, Kinetics and Statistical Thermodynamics II  
 Distribution functions. Ensembles. Entropy. Quantum generalization. Perfect gases with internal degrees of freedom.  
 (Offered 1968–69, Winter quarter)

**12.896 Statistical Mechanics II** Prep. 12.895, Statistical Mechanics I  
 Quantum perfect gases. Fermi-Dirac and Bose-Einstein Statistics. Some simple solids. Application to liquids and solutions.  
 (Offered 1968–69, Spring quarter)

**12.897 Quantum Chemistry I** Prep. 12.886, Atomic and Molecular Structure II  
 Classical mechanics. Formulation of quantum mechanics. The quantum mechanics of some simple systems. The hydrogen atom. Approximate methods.  
 (Offered 1967–68, Fall quarter)

**12.898 Quantum Chemistry II** Prep. 12.897, Quantum Chemistry I  
 Atomic structure. Group theory. Electronic states of diatomic molecules.  
 (Offered 1967–68, Winter quarter)

**12.899 Quantum Chemistry III** Prep. 12.898, Quantum Chemistry II  
 Polyatomic molecules. Full rotation group and angular momentum. Atoms and molecules treated by group theory.  
 (Offered 1967–68, Spring quarter)

**12.901 Polymer Chemistry I** Prep. One year of organic chemistry and one year of physical chemistry  
 Basic principles of polymer chemistry. Description and classification of high polymers. Addition and condensation polymerization. Copolymerization.  
 (Offered yearly, Fall quarter)

**12.902 Polymer Chemistry II** Prep. 12.901, Polymer Chemistry I  
 Introduction to the study of polymer structure and its significance. Polymer degradation. Introduction to the use of polymers in industrial applications.  
 (Offered yearly, Winter quarter)

**12.903 Polymer Chemistry III** Prep. 12.902, Polymer Chemistry II  
 The principles and modern practices in polymer usage. Coatings. Pigmentation. Plasticization. Reinforced Plastics. Inorganic Polymers.  
 (Offered yearly, Spring quarter)

**12.921 Biochemistry I** Prep. 12.862, Advanced Organic Chemistry II and one year of physical chemistry  
 Consideration of protein chemistry including structure, acid-base equilibria, protein interactions, and proteins as enzymes. Equilibria and free energy of biochemical systems. Enzyme kinetics.  
 (Offered yearly, Fall quarter)



12.922 Biochemistry II Prep. 12.921, Biochemistry I

## Biological oxidation-reduction. Intermediary metabolism.

(Offered yearly, Winter quarter)

12.923 Biochemistry III Prep. 12.922, Biochemistry II

A continuation of intermediary metabolism.

10,000 Series (1-100) Page Attributed to the author

**2.990 Seminar (1 credit)** Prep. Admission to the graduate  
program.

#### Oral reports by the participants on current or recent investigations in

Oral reports by the participants on current or recent investigations in chemistry. (Offered yearly, Fall, Winter, and Spring quarters)

Original research and a written thesis thereon, under supervision of a faculty member (Offered yearly, every quarter)

12.995 Research and Thesis for Ph.D. Prep. Ph.D. candidacy

Original research in depth, representing a significant contribution of new chemical knowledge, and a written thesis thereon, under the supervision of a faculty member. (Offered yearly, every quarter)

# Economics

## Admission

To be enrolled for graduate work in economics, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included a minimum of 18 semester hours of economics, or the equivalent, of which three semester hours, or the equivalent, must be statistics. The Graduate Record Examination in Economics is recommended but it is not required for admission.

## THE MASTER'S DEGREE

Forty quarter hour credits of academic work are required. This program comprises 16 quarter hours of required work and 24 quarter hours of electives of which a minimum of nine quarter hours must be selected from one of the economic fields listed below. The required courses must be completed as soon as possible. With the approval of the graduate adviser, a maximum of six quarter hours may be elected from graduate courses offered by other departments as well as one advanced undergraduate course in economics carrying three quarter hours of graduate credit.

## Comprehensive Examination

A comprehensive examination which will be held in accordance with the general Graduate Division regulations must be taken by all students who do not offer a Master's thesis.

## Master's Thesis

A Master's thesis for nine quarter hours of credit is optional with the approval of the graduate adviser.

## Required Courses

The required courses are:

	Credits
39.900 Macroeconomic Theory .....	4
39.901 Microeconomic Theory .....	4
39.907 Mathematics for Economists* .....	4
39.908 Statistical Inference .....	4

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\*On approval of the graduate adviser, an elective may be substituted for this required course if the student can provide evidence of the necessary degree of mathematical competence.

## **Economic Fields**

Available economic fields are listed below. Under each field are stated the required field courses and the elective field courses. Students must take at least nine quarter hours in one field of concentration. In all fields except Dynamic Aggregate Economics, the first listed required course in the field ordinarily should be taken first by the student majoring in that field. For students not majoring in the field, courses in the field may be taken in any sequence.

### *Manpower Economics*

#### Required field courses:

- 39.928      Economics of the Labor Market
- 39.931      Seminar in Human Resources Development

#### Elective field courses:

- 39.929      Labor and Industrial Relations
- 39.930      Economics of Manpower Planning

### *Development Economics*

#### Required field courses:

- 39.934      Economic Development
- 39.935      Economic Planning

#### Elective field courses:

- 39.914      Economics of Growth
- 39.930      Economics of Manpower Planning
- 39.936      Economic Systems
- 39.940      International Trade I

### *Monetary Economics*

#### Required field courses:

- 39.924      Monetary Theory
- 39.925      Theory of Monetary Policy

#### Elective field courses:

- 39.915      Economic Fluctuations
- 39.920      Fiscal Policy
- 39.926      Problems in Money and Banking

### *Quantitative Economics*

#### Required field courses:

- 39.910      Mathematical Economics
- 39.911      Research Methods
- 39.912      Introduction to Econometrics

*International Economics*

Required field courses:

39.940 International Trade I  
 39.941 International Trade II

Elective field courses:

39.934 Economic Development  
 39.924 Monetary Theory  
 39.920 Fiscal Policy

*Dynamic Aggregate Economics*

Required field courses:

39.914 Economics of Growth  
 39.915 Economic Fluctuations

Elective field courses:

39.924 Monetary Theory  
 39.920 Fiscal Policy  
 39.925 Theory of Monetary Policy

**DESCRIPTION OF COURSES**

All courses carry three quarter hours of credit unless otherwise specified.

**39.900 Microeconomic Theory** Prep. Admission to the graduate program in economics

Meaning of economic theory and models. Costs and production functions. Utility functions and demand. Market structures and equilibrium of firm. Factor pricing. (Offered yearly, Fall and Winter quarters)

**39.901 Macroeconomic Theory** Prep. Admission to the graduate program in economics

Analysis of aggregate economic relationships in the context of Classical and Keynesian theories. Fiscal and monetary policy implications are studied. (Offered yearly, Fall and Winter quarters)

**39.907 Mathematics for Economists** Prep. Admission to the graduate program in economics

Differential and Integral Calculus and its relationship to economic and statistical models. Applications include marginal analysis, minimizing with respect to time series and correlation models, and probability density functions. (Offered yearly, Fall quarter)

**39.908 Statistical Inference**

Estimation of population values and testing hypotheses. Classical estimation and testing compared to Bayesian Probability. Topics covered include the normal, t, binomial, poisson, hypergeometric, exponential,  $X^2$ , F and other probability distributions and the design of sample surveys. (Offered yearly, Winter quarter)

**39.910 Mathematical Economics**

The cobweb and other simple dynamic models. The Multiplier, The Acceleration Principle. Mathematical Analysis: Complex Numbers, Linear Difference and Differential Equations. Trade Cycle Theory, General Economic Equilibrium, Inter-industry Relations, Programming, Activity Analysis and Elementary Theory of Games. (Offered yearly, Winter quarter)

**39.911 Research Methods**

Mathematical programming with emphasis on linear programming, including the transportation and simplex problems, and simulation and queuing theory with applications to the 1620 computer.

(Offered yearly, Spring quarter)

**39.912 Introduction to Econometrics**

Estimation of demand, supply, cost and production functions; Applications of Multivariate Analysis to Economic Data; Identification; Determination of Trend, Oscillation and Periodic Movements; Autocorrelation and Correlogram Analysis; Trends in Multiple Regression.

(Offered yearly, Spring quarter)

**39.914 Economics of Growth**

A study of economic growth of developed capitalist economies with special reference to United States. Inquiry into the growth record, causes of growth, growth models, and growth policies. (Offered yearly, Fall quarter)

**39.915 Economic Fluctuations**

A theoretical and empirical analysis of the causes and consequences of fluctuations in economic activity. Critical survey of current theories of economic fluctuations, with applications to postwar fluctuations in United States.

(Offered yearly, Winter quarter)

**39.919 Public Finance**

A survey of governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationships to principles of economic welfare. It will include discussions on taxation, tax incidence, tax theory, debt management and employment levels.

(Offered yearly, Winter quarter)

**39.920 Fiscal Policy**

A study of deliberate adjustments in revenues and expenditures for the purpose of obtaining greater economic stability and economic growth. It will include discussion on neutral fiscal policy, built-in stabilizers, budget management, attainment of full employment, inflation and deflation.

(Offered yearly, Spring quarter)

**39.924 Monetary Theory**

A study of money and money flows; an analysis of the quantity theory of money, velocity, and the role of financial intermediaries.

(Offered yearly, Fall quarter)

**39.925 The Theory of Monetary Policy**

A study of financial markets and of monetary policy objectives and instruments; an analysis of the incidence and effectiveness of monetary policy and debt management.

(Offered yearly, Winter quarter)

**39.926 Problems in Money and Banking**

Study of the structure, operations, and development of commercial banking and of the Federal Reserve System. Emphasis upon recent issues, problems, and proposals.

(Offered yearly, Spring quarter)

**39.928 Economics of the Labor Market**

Analysis of the Labor market and effects on occupational and industrial structure. Topics include labor supply and allocation, wage and employment determination, level and composition of employment and unemployment, income distribution.

(Offered yearly, Fall quarter)

**39.929 Labor and Industrial Relations**

Analysis of institutional factors such as trade unions and collective bargaining, and their impact upon the labor market and the use of the labor force.

(Offered yearly, Winter quarter)

**39.930 Economics of Manpower Planning**

Various methods of manpower planning. Analysis of experiences in different countries. Role of education and training.

(Offered yearly, Winter quarter)

**39.931 Seminar in Human Resources Development**

Selected problems in the development of human resources.

(Offered yearly, Spring quarter)

**39.934 Economic Development**

A study of the prospects of economic growth in less developed areas. Measurement of development. Theories of economic growth applicable to less developed areas. Sectoral and regional development. Factors and institutions in economic development, such as human and natural resources, education, technology, capital formation, etc. Growth and welfare economics.

(Offered yearly, Fall quarter)

**39.935 Economic Planning**

A study of the role of the public sector in economic development. The private and public sector. The concept of planning as applied to advanced and less developed areas. Programming techniques at microeconomic and macroeconomic levels. Input-output analysis, operational and indicative—centralized and decentralized planning.

(Offered yearly, Winter quarter)

**39.936 Economic Systems**

A study of current alternatives to capitalism. Classical and revisionist Marxism. Theory and practice of economic organization in centralized and decentralized socialist systems. The corporate state, etatism. The "converging" hypothesis. Measurement of efficiency in various mixed systems.

(Offered yearly, Spring quarter)

**39.940 International Trade I**

The Classical Theory of International Trade with particular reference to the Theory of Comparative Advantage, its modern treatment and empirical verification. The Neo-classical Theory of International Trade: Analysis of offer curve, transformation function, community indifference, opportunity cost, existence and stability of equilibrium.

(Offered yearly, Winter quarter)

**39.941 International Trade II**

The modern theory of international trade: Factor price equalization theorem, the Stolper-Samuelson Theorem, The Leontief Paradox, the CES production function.

(Offered yearly, Spring quarter)

**39.950 Industrial Organization**

Various forms of economic concentration, competition, monopolistic competition, oligopoly, monopoly. Criteria for appraisal of the economic results of various types of industrial organization will be developed within a framework of theory and empirical studies. Public and private remedial policy aspects are also considered through the use of anti-trust cases.

(Offered yearly, Spring quarter)

**39.960 History of Economic Thought**

The evolution of economic observation, inquiry, analysis and policy. Observations of the Socratic philosophers are surveyed. The Medieval Scholastic interpretations of the just price and usury prohibition. The emergence and refinement of Mercantilism and its antithesis, economic liberalism, the Physiocratic and Classical schools. Contributions of the Historical and Marginalist schools. The Neo-Classical synthesis. Criticism of economic orthodoxy, Socialist and Marxian thought. The Keynesian Revolution.

(Offered yearly, Spring quarter)

**39.990 Readings in Economics**

Prep. Consent of the Department

Supervised readings in selected topics in economics.

Credits: 1.

(Offered yearly, every quarter)

**39.991 Thesis Seminar**

Thesis supervision by members of Department.

Credits: 9 quarter hours.

# *English*

## Admission

To be enrolled for graduate work in English, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least 15 semester hours of English.

## THE MASTER'S DEGREE

### Program

Forty quarter hour credits of academic work are required. With the approval of the faculty advisor, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of 8 quarter hours may be elected from advanced undergraduate courses.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries nine quarter hours of credit.

### Language Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, to be specified by the Department.

## DESCRIPTION OF COURSES

All courses carry three quarter hours credits unless specified otherwise.

### 30.801 History of English Literature

A survey of English literature from an introductory point of view, primarily designed for graduate students new to the English major. The first unit will study major and minor authors from Chaucer to Marlowe.  
(Offered Fall quarter)

### 30.802 History of English Literature

Major and minor authors from Shakespeare to Samuel Johnson.  
(Offered Winter quarter)

### 30.803 History of English Literature

Major and minor authors from Collins to Thomas Hardy.  
(Offered Spring quarter)

### 30.804 The American Novel, 1900–1929

A study into the changing technical, thematic and influential elements in the works of Cather, Wharton, Cabell, Anderson, Hemingway, Faulkner, and Lewis.  
(Offered Fall quarter)

### 30.805 The American Novel, 1930–1949

A critical study of the themes, techniques and influences of this period as expressed in the works of Faulkner, Farrell, Wolfe, Warren, Dos Passos, and Steinbeck.  
(Offered Winter quarter)

**30.806 The American Novel, 1950–1965**

An examination of recent trends in the novel as expressed in the works of Salinger, Mailer, Bellow, Barth, Roth, Rand, and Baldwin.

(Offered Spring quarter)

**30.809 The Romance in America**

A critical study of the romance as a literary form, with special emphasis upon the work of Poe, Hawthorne and Melville. (Offered Fall quarter)

**30.810 American Transcendentalism**

A critical study of the American Transcendental movement with special emphasis upon the works of Emerson, Thoreau and Whitman.

(Offered Winter quarter)

**30.811 The Rise of Realism**

The examination of Local Colorism, Realism, and Naturalism in the works of Twain, Howells, James, Freiser, and Norris. (Offered Spring quarter)

**30.813 American Literary Movements—The Novel—The Beginnings**

Selected novels of C. B. Brown, H. H. Brackenridge, J. F. Cooper, N. Hawthorne, W. G. Simms, H. B. Stowe. Emphasis on the development of the novel as a naturalized art form, suitable to American subjects.

(Offered Fall quarter)

**30.814 The Nineteenth-Century Masters**

Selected novels of Crane, Howells, Frederic, James, Melville, Norris, Twain. Emphasis on the contributions of the latter 19th century writers to world literature, and on the shifting emphasis occurring during the period.

(Offered Winter quarter)

**30.815 Twentieth-Century Experiment and Exploration**

Selected Novels of Dreiser, Wharton, Lewis, Fitzgerald, Dos Passos, Steinbeck, Faulkner, Hemingway, Wharton. Emphasis on the experimental nature of many of the novelists of the first four decades of the century. Reports, Examinations. Limited to 15.

(Offered Spring quarter)

**30.819 Literary Criticism — Classical and Medieval**

Literature and critical principles, classical and medieval. Special attention to Plato, Aristotle, Horace, Longinus, and Dante.

(Offered Fall quarter)

**30.820 Literary Criticism — Renaissance through Victorian**

English and Continental critical principles and relevant literary works: Jonson through Tolstoy.

(Offered Winter quarter)

**30.821 Literary Criticism — Modern**

English, Continental, and American critical principles in theory and as embodied in the modern novel, drama, poem, and short story.

(Offered Spring quarter)

**30.825 English Novelists**

A survey of the 18th century novel with particular emphasis on its origins and development drawn from readings of Defoe, Richardson, Fielding, Smollett, and Sterne.

(Offered Fall quarter)

**30.826 English Novelists**

A survey of the 19th century novel with special attention to such emerging types as the novel of manners, the gothic novel and the novel of social protest drawn from readings of Austen, Thackeray, the Brontes, Dickens, and Eliot.

(Offered Winter quarter)

**30.827 English Novelists**

A survey of the later 19th century novel with particular attention to the intellectual and formal influences resulting in the rise of the modern novel drawn from readings of Trollope, Hardy, Galsworthy, Butler, James, and Conrad.

(Offered Spring quarter)

**30.831 English Poets — Chaucer — Troilus**

Early works of Chaucer, with particular attention to **Troilus and Criseyde**.  
(Offered Fall quarter)

**30.832 English Poets I — Chaucer — Tales**

Fragments 1, 2, and 7 of the **Canterbury Tales** with particular attention to the tales of the Knight, the Miller, the Shipman, the Prioress, and the Priest.

(Offered Winter quarter)

**30.833 English Poets II — Chaucer — Tales**

Fragments 3, 4, 5, 6, 8, 9, and 10 of the **Canterbury Tales** with particular attention to the tales of the Wife, the Clerk, the Merchant, the Pardoner, and the Manciple.

(Offered Spring quarter)

**30.837 English Poets II — Spenser, (FQ)**

The **Faerie Queene**, with attention to the minor poems as an aid in understanding the major work.

(Offered Fall quarter)

**30.838 English Poets II — Milton**

Minor poems and prose of Milton, with particular attention to Lycidas, Samson Agonistes, Areopagitica, L'Allegro, Il Penseroso, Comus, and the Sonnets.

(Offered Winter quarter)

**30.839 English Poets II — Milton**

**Paradise Lost**, with particular attention to the theological and scientific background.

(Offered Spring quarter)

**30.842 Non-dramatic Literature of the 16th Century I**

Poetry and prose of Skelton, Hawes, Wyatt, Surrey, More, Elyot, and others, making appropriate use of Northeastern's microfilms of English books. Class reports, a brief critical paper, and a long paper.

(Offered Fall quarter)

**30.843 Non-dramatic Literature of the 16th Century II**

Poetry and prose of Spenser (except the Faerie Queene), Sidney, Shakespeare, Daniel, Drayton, and others, making appropriate use of Northeastern's microfilms of English books. Class reports, a brief critical paper, and a long paper.  
(Offered Winter quarter)

**30.844 Non-dramatic Literature of the 17th Century**

Poetry and prose of Jonson, Donne, Herrick, Herbert, Vaughan, Bacon, Browne, and others, making appropriate use of Northeastern's microfilms of English books. Class reports, a brief critical paper, and a long paper.  
(Offered Spring quarter)

**30.849 Shakespeare — History Plays**

The English history plays, concentrating on two tetralogies, **Henry VI to Richard III**, and **Richard II to Henry V**.  
(Offered Fall quarter)

**30.850 Shakespeare — Comedy**

The major comedies from the **Taming of the Shrew** to **The Tempest**.  
(Offered Winter quarter)

**30.851 Shakespeare — Tragedy**

The principal tragedies, including **Hamlet**, **Othello**, **King Lear**, **Macbeth**.  
(Offered Spring quarter)

**30.857 Modern English and American Writers****Late Victorian and Edwardian**

The late Victorian and Edwardian periods. Among the writers to be studied are G.M. Hopkins, Hardy, the early Yeats; G.B. Shaw, H.G. Wells, Bennett, Conrad, Stephen Crane and the American naturalists; E.A. Robinson and Robert Frost.  
(Offered Fall quarter)

**30.858 Modern English and American Writers****World War I — World War II**

Writers from World War I to World War II, including D.H. Lawrence, Virginia Woolf, Aldous Huxley, the later Yeats, Auden; T.S. Eliot, Wallace Stevens, Fitzgerald, Hemingway, Faulkner, and E.E. Cummings.  
(Offered Winter quarter)

**30.859 Modern English and American Writers — Post World War II**

Writers since World War II, including Thomas, Amis, Wain, C.P. Snow, Updike, Cheever, and "the new poets."  
(Offered Spring quarter)

**30.867 Literary Composition — Fiction**

The writing of fiction, with emphasis upon the short story. Assignments in various modes and techniques, with particular attention to contemporary forms. Collateral readings in the short story from Hawthorne to Frank O'Connor. Critiques. (Offered Fall quarter)

**30.868 Literary Composition — Poetry**

The writing of poetry, with emphasis upon the elements of prosody. Assignments in various forms. Collateral readings and critiques. (Offered Winter quarter)

**30.869 Literary Composition — Essay**

The essay, the sketch, and criticism as literary forms. Assignments in various forms. Collateral readings and critiques, and an examination of prose style. (Offered Spring quarter)

**30.874 Augustan Age — Prose Satirists**

The origin and development of English verse satire, dealing mainly with Dryden, Samuel Butler and Pope. (Offered Fall quarter)

**30.874 Augustan Age — Prose Satirists**

The prose satirists in English, mainly Swift, Addison, and Goldsmith. (Offered Winter quarter)

**30.875 Augustan Age — Johnson and Boswell**

The beginnings of English biography leading up to and including Johnson and Boswell. (Offered Spring quarter)

**30.879 Introductory Anglo-Saxon**

The reading and translating of selections of prose from the outset, with progression from the simpler types. Phonology, morphology, and syntax will be treated as needed. Pertinent matters of linguistics will be considered. (Offered Fall quarter)

**30.880 Intermediate Anglo-Saxon**

Continuation of 30.879, with addition of several poems to the coverage. (Offered Winter quarter)

**30.881 Beowulf**

The reading and translating of at least half of the Anglo-Saxon epic **Beowulf**. Prerequisite: Courses 30.879 and 30.880 — one or both, at the discretion of the department chairman. (Offered Spring quarter)

**30.885 Historical Linguistics**

Language as a concept; origins of language; the concept of Indo-European; relationships and comparisons among languages; the place of etymology in linguistics. Supplementary reading. (Offered Fall quarter)

**30.886 Descriptive Linguistics**

Articulatory phonetics; stress and intonation; the morpheme; morphology; inflection; immediate constituents; syntax; transformations. Supplementary reading. (Offered Winter quarter)

**30.887 Descriptive Linguistics**

Acoustic phonetics; the phoneme; the process of communication; variation; writing versus speech. Supplementary reading. (Offered Spring quarter)

**30.891 Dante and His Times—Minor Works**

Dante's life and minor works as seen through the literary, political, and religious background of his times.

**30.892 Dante—Divina Commedia—Inferno**

General study of the Divina Commedia with particular analysis of the "Inferno."

**30.893 Dante—Divina Commedia—Purgatorio and Paradiso**

Close examination of the two "cantiche" of Dante's major work.

**30.901 English Romantic Poetry and Aesthetic Theory**

The early romantic movement. Close reading and discussion of works by Wordsworth and Coleridge. (Offered Fall quarter)

**30.902 The Lyric Development of English Romanticism**

A further study of poetry and aesthetic theory in the nineteenth century, with emphasis upon the works of Keats and Shelley.

(Offered Winter quarter)

**30.903 Victorian Poetry and Aesthetic Theory**

Special consideration of works by Tennyson, Arnold, Swinburne, the Pre-Raphaelite Brotherhood and the early Yeats.

(Offered Spring quarter)

**30.951 Major World Dramatists**

The art and influence of major dramatists upon the texture of world drama. An examination of the work of Sophocles, Aristophanes, Marlowe, Jonson, Moliere, Racine, Lope de Vega, Sheridan, Victor Hugo.

(Offered Fall quarter)

**30.952 Major Modern Dramatists**

The art and influence of major modern dramatists upon the texture of modern drama. An examination of the works of Ibsen, Strindberg, Chekhov, Pirandello, Shaw, O'Casey, O'Neill, Brecht, the Dramatists of the Absurd. (Offered Winter quarter)

**30.953 Modern American Theatre**

An examination and evaluation of the works of playwrights and forces which shaped the contemporary American Theatre: the work of O'Neill, Anderson, Rice, Sherwood, Hellman, Odets, Williams, Miller, Albee. The effects of the "little theatre movement," the off-Broadway movement, the university theatre, and the musical theatre upon the development of theatre in America.

(Offered Spring quarter)

**30.955 Seminar in Comedy**

The Comic Spirit and its manifestations in dramatic literature and performance. The nature and form of comic playwriting from Aristophanes to the present. An examination of the theatre's comic forms — farce, comedy, satire, parody.

(Offered Fall quarter)

**30.956 Seminar in Tragedy**

The nature of tragic drama based on the study of plays and theories. An examination of the various ancient and modern attitudes toward the problems of tragedy.

(Offered Winter quarters)

**30.957 Seminar in Theatrical Styles**

An examination of the realistic-naturalistic, expressionistic, and theatrical styles.

(Offered Spring quarter)

**30.991 Thesis**

Thesis supervision by members of the department.

Credits: 9 quarter hours.



# *History*

## THE MASTER'S DEGREE

### Admission

To be enrolled for graduate work in history, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least 15 semester hours of history.

Applicants for the full-time program must take the aptitude and history achievement portions of the Graduate Record Examination in the Fall before they make application; applicants for the part-time program are strongly urged to take the Graduate Record Examination.

### Program

Forty-two quarter hour credits of academic work are required. The course work must include 23.800, Methodology and Early Historiography, 23.801, Modern European Historiography, 23.900, American Historians, and two courses specifically labeled "seminar." Students enrolling in seminars must have time available for research in libraries. The distribution of courses must be such that not more than 24 quarter hours of credit are taken from courses in either Group I or Group II.

#### Group I—Eastern Hemisphere

23.800	Methodology and Early Historiography	23.831	British History, 1815–1914
23.801	Modern European Historiography	23.832	Seminar in Twentieth Century Britain
23.806	Intellectual History of Europe, 1688–1789	23.833	Seminar in Nineteenth Century England
23.807	Intellectual History of Europe, 1789–1870	23.837	Seventeenth Century France
23.808	Intellectual History of Europe, 1870–1950	23.838	Eighteenth Century France
23.811	Social and Economic History of Europe, 1500–1700	23.840	France and Germany, 1870–1918
23.812	Social and Economic History of Europe, 1700–1848	23.841	France and Germany Since 1918
23.813	Seminar in Europe, 1500–1700	23.850	Seminar in Russian History
23.817	Medieval Institutions	23.860	Diplomatic History of Europe, 1815–1914
23.818	Seminar in the Renaissance	23.862	Twentieth-Century Europe
23.820	The Renaissance	23.863	Seminar in Twentieth Century Europe

23.821	The Reformation	23.870	China to 1800
23.827	Seminar in England, 1558–1660	23.871	Modern China
23.830	British History, 1688–1815	23.875	Modern Japan

### Group II—Western Hemisphere

23.900	American Historians	23.925	Seminar in American Economic History
23.905	Colonial America: The Seventeenth Century	23.930	The Westward Movement in the United States in the Nineteenth Century
23.906	Colonial America: The Eighteenth Century		
23.907	Seminar in the American Revolution and Constitution	23.931	Man and Land in the United States in the Twentieth Century
23.910	American Social History, 1607–1815	23.935	Seminar in Recent American History
23.911	American Social History, 1815–1900	23.941	American Diplomatic History, 1775–1889
23.912	American Social History, 1900–1950	23.942	American Diplomatic History Since 1889
23.913	American Intellectual History, 1750–1865	23.943	Seminar in American Diplomatic History
23.914	American Intellectual History Since the Civil War	23.970	The United States and the Caribbean Region
23.915	Seminar in American Intellectual History	23.971	Mexican History
23.917	American Cultural History	23.973	South America to 1900
23.920	Seminar in American Urban History	23.974	South America Since 1900
		23.975	Seminar in South American History

With the approval of the faculty advisor, a maximum of nine quarter hours of credit may be elected from graduate courses in other departments and a maximum of twelve quarter hours of credit may be elected from advanced undergraduate courses in history.

A thesis is optional with the approval of the Chairman of the Department. If approved, a thesis carries nine quarter hours of credit.

### Comprehensive Examination

This examination will be held in accordance with the general Graduate Division regulations.

## Language Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, to be approved by the department.

## DESCRIPTION OF COURSES

All courses carry three quarter hour credits unless otherwise specified.

### **23.800 Methodology and Early Historiography**

The objectives, methods, and resources of the historian; and an analysis of the historical writings of ancient and medieval times.

(Offered yearly, Fall quarter)

### **23.801 Modern European Historiography**

The development of historical writing from the Renaissance to the present. Representative historians will be studied and there will be some consideration of the philosophy of history. (Offered yearly, Winter quarter)

### **23.806 Intellectual History of Europe, 1688–1789**

The broad spectrum of eighteenth-century thought, with emphasis on scientific, religious, and political ideas. (Offered 1967–68, Fall quarter)

### **23.807 Intellectual History of Europe, 1789–1870**

The great age of liberal and nationalistic thought. Social problems created by industrialism and various proposals to solve these problems will be examined. (Offered 1967–68, Winter quarter)

### **23.808 Intellectual History of Europe, 1870–1950**

The intellectual developments which have brought Europe to its present position in world affairs. Topics considered include theories of evolution, scientism, radical socialism, and fascism.

(Offered 1967–68, Spring quarter)

### **23.811 Social and Economic History of Europe, 1500–1700**

The decline of medieval feudal and manorial institutions; the rise of capitalism and the age of exploration; the social and economic impact of the wars of religion. (Offered 1967–68, Fall quarter)

### **23.812 Social and Economic History of Europe, 1700–1848**

The social and economic effects of the Age of Reason, with attention to the decline of mercantilism, the independence of British, French, and Spanish colonies, and the agricultural and industrial revolutions.

(Offered 1967–68, Spring quarter)

### **23.813 Seminar in Europe, 1500–1700**

Research and writing on sixteenth and seventeenth-century European history, with special emphasis on social and economic topics.

(Offered 1967–68, Winter quarter)

**23.817 Medieval Institutions**

Political, economic, and religious institutions in England and France from the fourth to the thirteenth centuries. (Offered Summer, 1967)

**23.818 Seminar in the Renaissance**

Research and writing in topics concerning the Renaissance.

(Offered 1967-68, Winter quarter)

**23.820 The Renaissance**

European political and cultural life from the thirteenth to the seventeenth centuries, with attention to Humanism and to the rebirth of classicism in literature and the arts. (Offered 1967-68, Fall quarter)

**23.821 The Reformation**

The development of the Christian Church from the thirteenth to the seventeenth centuries, with attention to the conflict between church and state, the impact of the Renaissance, the rise of the Protestant sects, and the wars of religion. (Offered 1967-68, Spring quarter)

**23.827 Seminar in England, 1558-1660**

A study of political, religious, social, and economic problems from Elizabeth I to the Restoration. (Offered 1967-68, Spring quarter)

**23.830 British History, 1688-1815**

The great constitutional and parliamentary developments in Britain from the Glorious Revolution to Waterloo, with attention to social and economic aspects of the same period. (Offered yearly, Fall quarter)

**23.831 British History, 1815-1914**

The age of Pax Britannica, with emphasis on the growth of democracy, social reform and socialism, and Victorian society and culture.

(Offered yearly, Winter quarter)

**23.832 Seminar in Twentieth-Century Britain**

The seminar will focus on British political parties in the 1930's, with special emphasis on the development of their foreign policies.

(Offered 1968-69, Spring quarter)

**23.833 Seminar in Nineteenth-Century England**

Liberalism, conservatism, and the progress of the English people will be the theme of the seminar. All students will write research papers.

(Offered 1967-68, Winter quarter)

**23.837 Seventeenth-Century France**

Society and government in France, with attention to economic and intellectual developments from the reign of Henry IV to the Peace of Utrecht.

(Offered 1967-68, Fall quarter)

**23.838 Eighteenth-Century France**

Origins of the French Revolution; the development of revolution in France; and the impact of Napoleon. (Offered 1967-68, Winter quarter)

**23.840 France and Germany, 1870–1918**

The rise of Germany as the dominant power in Europe in 1870–71, with attention to French attempts to regain power and to German attempts to maintain and extend their influence.

(Offered 1968–69, Fall quarter)

**23.841 France and Germany since 1918**

The continuing struggle of France and Germany for European hegemony in the light of new theories and new international factors.

(Offered 1968–69, Winter quarter)

**23.850 Seminar in Russian History**

A narrow period or special topic in Russian history. The course presupposes a basic knowledge of Russian history and will require extensive work on a research paper. (Offered 1968–69, Spring quarter)

**23.860 Diplomatic History of Europe, 1815–1914**

The foreign policies of the chief European powers, with emphasis on changing alliances and alignments, imperialistic rivalries, and efforts at international cooperation. (Offered 1967–68, Spring quarter)

**23.862 Twentieth-Century Europe**

The political history of Europe since 1900, with attention to World War I, the rise of Communism and Fascism, the struggle for security in the western democracies, World War II, and the Cold War.

(Offered Summer, 1967)

**23.863 Seminar in Twentieth-Century Europe**

A study of selected political controversies in Europe since 1900.

(Offered 1968–69, Winter quarter)

**23.870 China to 1800**

History of Chinese civilization from antiquity through Confucianism to the period of Western impact. (Offered 1967–68, Fall quarter)

**23.871 Modern China**

Revolution and institutional change in China from the nineteenth century to the present, including a study of the Communist period.

(Offered 1967–68, Winter quarter)

**23.875 Modern Japan**

The forces of tradition and change in modern Japan, with special attention to the period after World War II. (Offered 1967–68, Spring quarter)

**23.900 American Historians**

The writing of American history by Americans from colonial times to the present with emphasis on changes in both form and substance.

(Offered yearly, Spring quarter)

**23.905 Colonial America: The Seventeenth Century**

Exploration of the New World, settlement of the English North American mainland colonies, and the adaptation of European institutions and ideas to New World conditions. (Offered 1967-68, Fall quarter)

**23.906 Colonial America: The Eighteenth Century**

The expansion of the English colonies in the New World, the development of political and social institutions, and the sources of friction with England. (Offered 1967-68, Winter quarter)

**23.907 Seminar in the American Revolution and Constitution**

Each member of the seminar will write a research paper on some topic in American history between 1763 and 1789. There will be discussions of sources and of what major historians have said about the Revolution and Constitution. (Offered 1967-68, Spring quarter)

**23.910 American Social History, 1607-1815**

The ethnic foundation of American society; the ways Americans made their livings, and the ways in which they lived during the colonial and early national periods. (Offered 1967-68, Fall quarter)

**23.911 American Social History, 1815-1900**

The King Cotton society of the South, the ferment of reform and industrialism in the North, the Civil War, and the materialistic civilization of the late nineteenth century. (Offered 1967-68, Winter quarter)

**23.912 American Social History, 1900-1950**

The transformation of the naive and idealistic America of the early twentieth century to life in a world in which technology has far outstripped man's mental and moral capacity to cope with it.

(Offered 1967-68, Spring quarter)

**23.913 American Intellectual History, 1750-1865**

American attitudes toward the individual and toward government during the Enlightenment, the romantic movement, and the slavery controversy. (Offered yearly, Fall quarter)

**23.914 American Intellectual History Since the Civil War**

The adaptation of the ideas of an agricultural society to the conditions of an urban and industrial society. (Offered yearly, Winter quarter)

**23.915 Seminar in American Intellectual History**

The seminar will focus upon a single figure in American intellectual history. His writings and writings about him will be analyzed. Seminar papers will be required of all students. (Offered yearly, Spring quarter)

**23.917 American Cultural History**

The transplanting of European culture and the development of an American culture as reflected in American architecture.

(Offered 1967-68, Spring quarter)

**23.920 Seminar in American Urban History**

The political, economic, and social history of America's major cities, with special emphasis on Boston's last century.

(Offered 1967-68, Winter quarter)

**23.925 Seminar in American Economic History**

The development of the American economy from 1800 to the present, with special attention to the history of transportation. Topics include the development of highways, canals, railroads, and airlines, with an examination of the roles of private enterprise and government.

(Offered 1968-69, Winter quarter)

**23.930 The Westward Movement in the United States in the Nineteenth Century**

Westward migration into the various geographic provinces will be traced, with emphasis upon its causes, processes, and its economic and political influences. Economic aspects stressed will be those relating to the land: agriculture, mining, lumbering, and grazing.

(Offered 1968-69, Spring quarter)

**23.931 Man and Land in the United States in the Twentieth Century**

Aspects of land use in America since the closing of the frontier, with attention to agriculture and mining and to conservation programs.

(Offered 1967-68, Spring quarter)

**23.935 Seminar in Recent American History**

Special topics from the period 1896 to 1960 will be studied in detail, and students will present a research paper on a major person, action, or movement.

(Offered 1968-69, Winter quarter)

**23.941 American Diplomatic History, 1775-1889**

The history of American foreign policy and foreign relations from the American Revolution to 1889.

(Offered 1967-68, Fall quarter)

**23.942 American Diplomatic History Since 1889**

The United States in the age of world involvement and responsibility; the imperialistic episode; the world wars; international organizations and alliances.

(Offered 1967-68, Winter quarter)

**23.943 Seminar in American Diplomatic History**

Research and writing on selected topics in the history of American foreign relations.

(Offered 1967-68, Spring quarter)

**23.970 The United States and the Caribbean Region**

The Caribbean policy of the United States from the Monroe Doctrine, Manifest Destiny, Imperialism, the Big Stick, Dollar Diplomacy to the Good Neighbor and Alliance for Progress.

(Offered 1968-69, Fall quarter)

**23.971 Mexican History**

The making of modern Mexico from its Indian and Spanish beginnings to the present. (Offered 1968-69, Spring quarter)

**23.973 South America to 1900**

The European impact on South America, the movements for independence, and the nineteenth-century history of the new republics.

(Offered 1967-68, Fall quarter)

**23.974 South America Since 1900**

The internal developments of the South American republics and their relations with one another and with other nations in the twentieth century.

(Offered 1967-68, Winter quarter)

**23.975 Seminar in South American History**

Research and writing on special topics in the history of the South American republics. (Offered 1967-68, Spring quarter)

**23.990 Assigned Reading in History**

Assigned reading under supervision of a faculty member.

Credits: 1 quarter hour.

**23.991 Thesis**

Thesis supervision by members of the department.

Credits: 9 quarter hours.



# *Mathematics*

## Admission

To be enrolled for graduate work in mathematics, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least one semester of linear algebra, one semester of modern algebra, and two semesters of advanced calculus.

## THE MASTER'S DEGREE

### Full-Time Program

Options are available in either pure mathematics or applied mathematics. The latter program operates primarily on the Co-operative Plan as described later. The following courses are required.

	Credits
10.913 Theory of Functions of a Real Variable . . . . .	4
10.914 Theory of Functions of a Real Variable . . . . .	4
10.917 Theory of Functions of a Complex Variable . . . .	4
or	
10.905 Complex Analysis . . . . .	4
10.920 Theory of Functions of a Complex Variable . . . .	4
or	
10.906 Complex Analysis . . . . .	<u>4</u>
	<u>16</u>

### Pure Mathematics Option

Forty quarter hours of academic credit are required. The program of courses will be approved by a faculty advisor and will normally be taken according to the following pattern by students who devote about half time to teaching or other responsibilities. (Students who do not have such responsibilities may pursue the program at an accelerated rate.)

### FIRST YEAR

Fall Quarter	Credits	Winter Quarter	Credits
10.913 Theory of Functions of a Real Variable . . . . .	4	10.914 Theory of Functions of a Real Variable . . . . .	4
10.924 Algebra . . . . .	<u>3</u>	10.925 Algebra . . . . .	<u>3</u>

Spring Quarter	Credits
10.931 Functional Analysis . . . . .	4
10.926 Algebra . . . . .	<u>3</u>

**SECOND YEAR**

Fall Quarter	Credits	Winter Quarter	Credits
10.917 Theory of Functions of a Complex Variable .....	4	10.920 Theory of Functions of a Complex Variable .....	4
10.907 Algebraic Topology .....	<u>4</u>	10.908 Algebraic Topology .....	<u>4</u>
	<u>8</u>		<u>8</u>
Spring Quarter	Credits		
Elective .....	<u>4</u>		<u>4</u>

**Applied Mathematics Option**

Forty quarter hours of academic credit are required. This program operates on the Co-operative Plan in which students take academic work in the Fall and Spring quarters of the first year and in the Summer and Winter quarters of the second year. In the two academic years, three quarters are available for professional work.

The sequence of courses are normally taken according to the following pattern:

**FIRST YEAR**

Fall Quarter	Credits	Spring Quarter	Credits
10.913 Theory of Functions of a Real Variable ....	4	10.914 Theory of Functions of a Real Variable ....	4
10.905 Complex Analysis .....	4	10.906 Complex Analysis .....	4
10.873 Matrix Analysis ...	<u>4</u>	10.843 Advanced Differential Equations .....	<u>4</u>
	<u>12</u>		<u>12</u>

**SECOND YEAR**

Summer Quarter	Credits	Winter Quarter	Credits
10.848 Partial Differential Equations .....	3	10.849 Partial Differential Equations .....	3
10.990 Seminar .....	2	10.865 Approximation Theory .....	4
Elective .....	<u>4</u>	Elective .....	<u>4</u>
	<u>9</u>		<u>11</u>

### Other Requirements

There is no comprehensive examination required and no language requirement for the master's degree. A thesis is not required but may in some cases be substituted for an elective course with the approval of the department.

### Part-Time Evening Program

The admission requirements for this program are the same as for the full-time program, but students may progress according to their abilities and the time available.

If students are deficient in any of the mathematics courses required for admission to the degree program, they will be required to satisfy their deficiencies by taking courses given for this purpose. Such courses will carry graduate credit, but the credit will be in addition to the regular degree requirements. The following courses are required:

	Credits
10.901 General Topology . . . . .	2
10.911 Theory of Functions of a Real Variable . . . .	2
10.912 Theory of Functions of a Real Variable . . . .	2
10.915 Theory of Functions of a Complex Variable	2
10.916 Theory of Functions of a Complex Variable	2
10.918 Theory of Functions of a Complex Variable	<u>2</u>
	<u>12</u>

### Electives

Eighteen quarter hours of credit must be elected from mathematics courses. Ten quarter hours may be elected from any courses in the Graduate School of Arts and Sciences or the Graduate School of Engineering for which the student has the necessary preparation.

## THE DOCTOR OF PHILOSOPHY DEGREE

### Admission

Students admitted to full-time study in mathematics are eligible to take the qualifying examination in accordance with the information given under the heading of Qualifying Examination.

Applicants who have completed the requirements for their master's degree at another institution and who wish to apply at Northeastern University for doctoral work, should file an application, together with transcripts of all undergraduate and graduate work and two letters of recommendation, with the chairman of the department. The applicant will in some cases be asked to appear for an interview and subsequently be advised concerning his admittance to the program. The Departmental

Graduate Committee will determine whether he should take any course work before taking the qualifying examination. The Committee will also set a date on which the candidate must take his qualifying examination.

### **Residence Requirements**

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of half-time graduate work.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general Graduate Division regulations.

### **Qualifying Examination**

The qualifying examination for admission to candidacy must be taken by the end of the sixth quarter of the student's work. This examination will test the student's understanding of the basic material of real and complex analysis, algebra, general topology, and either algebraic topology or differential equations. A detailed syllabus for the examination may be obtained from the chairman of the department. The student will normally prepare for the examination by taking the program described for the master's degree requirements. If any part of this examination has been failed, the Departmental Graduate Committee will decide when it may be repeated and whether the student will be allowed probationary status in the meantime.

### **Minor Specialty**

Each doctoral candidate will select some specific mathematical subject of an advanced nature and by means of reading, lecture courses and/or seminars shall master the equivalent of one full year's course work in this area. Approval of the area in which the student intends to work should be obtained in advance from the Ph.D. committee. The purpose of this minor subject is to prevent the student's graduate training from becoming overspecialized and to guarantee some degree of breadth in his mathematical development. Consequently the topic must be sufficiently far from that area in which the student plans to write a dissertation.

When the candidate has completed his work, he will present a report on the subject in order to satisfy the Ph.D. committee of his mastery of the material. At the discretion of the committee, this report may be oral or written. The committee may also consider active participation in an appropriate seminar as a satisfactory indication of competence and allow it to be a substitute for such a report.

### **Course Requirements**

The course requirements, in addition to the minimum Master's degree requirements of 40 quarter hours of credit, are established by the Departmental Graduate Committee for each candidate. In most cases, 40 quarter hours of additional work will be required.

### **Thesis**

After the successful completion of his qualifying examination, each student shall select a thesis advisor under whose guidance he will write his doctoral thesis. If the student wishes it, the Departmental Graduate Committee will assist him in the selection of a thesis advisor. The thesis itself must represent an original solution of a problem in the chosen area of mathematics which makes some contribution to mathematical knowledge.

### **Language Requirement**

Ability to read and translate simple expository writing in two foreign languages must be established by each candidate. The degree of proficiency should in each case be sufficient for the student to read mathematical texts and journals with facility in the respective languages.

French, German, and Russian are the three most important foreign languages for the mathematician, in essentially equal degree, and the student may choose any two of these three languages in which to be examined. Any other choice of language must be approved by the Departmental Graduate Committee. In order to maximize the usefulness of these languages in his training, the student should take these examinations as early as possible. In any case, at least one of them must be passed before beginning work on the thesis. The examinations shall be administered by the Department of Mathematics. Further details concerning the examinations may be obtained from the Department Chairman.

### **Final Oral Examination**

This examination will be held in accordance with the Graduate Division regulations.

## **DESCRIPTION OF COURSES**

All courses carry two quarter hours of credit unless otherwise specified. Courses carrying three or four quarter hours of credits are offered in the day only.

The following courses are primarily for students in the engineering programs. These courses may not be used for credit toward the program in mathematics but may be taken in addition to the required course work in this field.

<b>10.801 Advanced Mathematics</b>	Prep. Differential Equations Series solution of differential equations; Legendre and Bessel functions; Laplace transforms; scalar and vector fields; gradient, divergence, and curl. (Offered yearly, every quarter)
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<b>10.802 Advanced Mathematics</b>	Prep. 10.801, Advanced Mathematics Fourier series and integrals, orthogonal functions, boundary-value problems involving partial differential equations: wave equation, heat flow, Laplace equation.
	(Offered yearly, every quarter)
<b>10.803 Advanced Mathematics</b>	Prep. Differential Equations Legendre and Bessel functions, Laplace transforms, Fourier integrals, boundary-value problems, introduction to matrix algebra.
Credits: 4 quarter hours.	(Offered yearly, Fall and Winter quarters)
<b>10.804 Advanced Mathematics</b>	Prep. 10.802, Advanced Mathematics Matrix algebra, determinants, inversion of matrices, rank and equivalence, linear equations and linear dependence, vector spaces and linear transformations.
	(Offered yearly, every quarter)
<b>10.805 Advanced Mathematics</b>	Prep. 10.804, Advanced Mathematics Further topics in matrices and vector spaces.
	(Offered yearly, every quarter)
<b>10.806 Advanced Mathematics</b>	Prep. Differential Equations This course, offered to day students, embodies the material in 10.804 and 10.805, Advanced Mathematics.
Credits: 4 quarter hours.	(Offered yearly, Fall and Winter quarters)
The following courses are offered for those who wish to enter the master's degree program in mathematics, but who fail to satisfy the admission requirements in algebra and/or advanced calculus. These courses will be taken in addition to the required course work in mathematics.	
Students in other programs may use these courses for elective credit.	
<b>10.811 Abstract Algebra</b>	Prep. Differential and Integral Calculus (Offered yearly, Fall quarter)
<b>10.812 Abstract Algebra</b>	Prep. 10.811, Abstract Algebra (Offered yearly, Winter quarter)
<b>10.813 Abstract Algebra</b>	Prep. 10.812, Abstract Algebra The content of 10.811 and the first half of 10.812 is as follows: Groups, subgroups, normal subgroups, rings, ideals, integral domains, and fields. The content of the second half of 10.812 and 10.813 is as follows: Linear spaces, linear transformations, inner product spaces, systems of linear equations, and algebra of matrices.
	(Offered yearly, Spring quarter)
<b>10.821 Advanced Calculus</b>	Prep. Differential and Integral Calculus Functions of one independent variable; limits, continuity, differentiability. Properties of continuous functions on a closed bounded interval. Rolle's theorem and the mean-value theorem.
	(Offered yearly, Fall quarter)

**10.822 Advanced Calculus** Prep. 10.821, Advanced Calculus  
 Functions of several independent variables. Distance and open sets; limits, continuity. Properties of continuous functions on a closed bounded set. Differentiability and differentials, mean-value theorem, implicit function theorems, Jacobians and transformations.  
 (Offered yearly, Winter quarter)

**10.823 Advanced Calculus** Prep. 10.822, Advanced Calculus  
 Sequences, sequences of functions, uniform convergence, series. Integration, line and surface integrals. (Offered yearly, Spring quarter)

The following courses may be used toward the degree requirements in mathematics and in all engineering and science fields.

**10.831 Probability** Prep. Differential and Integral Calculus  
 Fundamentals of probability theory; discrete and continuous probability distributions, including binomial, Poisson, and normal; law of large numbers and central limit theorem. (Offered yearly, every quarter)

**10.832 Probability** Prep. 10.831, Probability  
 Further study of probability distributions for one or more random variables. Special topics such as occupancy problems and Markov chains.  
 (Offered yearly, every quarter)

**10.834 Mathematical Statistics** Prep. 10.831, Probability or equivalent  
 Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression.  
 (Offered yearly, Fall and Winter quarters)

**10.835 Mathematical Statistics** Prep. 10.834, Mathematical Statistics  
 Analysis of variance; further topics in statistical inference.  
 (Offered yearly, Winter and Spring quarters)

**10.836 Mathematical Statistics** Prep. 10.831, Probability or equivalent  
 This course, offered to day students, embodies the material in 10.834 and 10.835, Mathematical Statistics.  
 Credits: 4 quarter hours. (Offered yearly, Spring quarter)

**10.838 Stochastic Processes** Prep. 10.832, Probability  
 Markov chains with discrete time parameter. Classification and limit properties, random walk, probability spaces for an infinite family of random variables. Kolmogorov's compatibility conditions. Conditional Expectations. Poisson processes, counting processes.  
 (Offered yearly, Spring quarter)

**10.841 Advanced Differential Equations** Prep. 10.804, Advanced Mathematics or 10.823, Advanced Calculus  
 (Offered 1967-68, Fall quarter)

**10.842 Advanced Differential Equations**      Prep. 10.841, Advanced Differential Equations  
 (Offered 1967–68, Winter quarter)

**10.843 Advanced Differential Equations**      Prep. 10.913, Theory of Functions of a Real Variable  
 Credits: 4 quarter hours.      (Offered yearly, Spring quarter)

The following material is covered in 10.841 and 10.842, Advanced Differential Equations. It is also covered as a unit in 10.843, Advanced Differential Equations.

Theory of the first-order differential equation and of systems of such equations; the linear second-order equation (initial-value and two-point boundary-value problems) with emphasis on the representation of solutions by means of eigen-functions. Applications to problems in physics.

**10.844 Advanced Differential Equations**      Prep. 10.842, Advanced Differential Equations  
 Differential equations in the complex plane; topology of integral curves; non-linear differential equations; stability theory; applications.  
 (Offered 1967–68, Spring quarter)

**10.845 Partial Differential Equations**      Prep. 10.912, Theory of Functions of a Real Variable and 10.918, Theory of Functions of a Complex Variable, or consent of the instructor  
 (Offered 1968–69, Fall quarter)

**10.846 Partial Differential Equations**      Prep. 10.845, Partial Differential Equations  
 (Offered 1968–69, Winter quarter)

**10.847 Partial Differential Equations**      Prep. 10.846, Partial Differential Equations  
 (Offered 1968–69, Spring quarter)

The content of courses 10.845, 10.846, and 10.847, Partial Differential Equations is the following: Study of first-order partial differential equations, then second-order equations. Transformation theory in the plane and space; methods of solution and properties of solutions of equations with initial and boundary conditions; existence and uniqueness problems.

**10.848 Partial Differential Equations**      Prep. 10.913, Theory of Functions of a Real Variable, or consent of the instructor  
 Credits: 3 quarter hours.      (Offered yearly, Summer quarter)

<b>10.849 Partial Differential Equations</b>	Prep. 10.848, Partial Differential Equations (Offered yearly, Winter quarter)
Credits: 3 quarter hours.	The content of courses 10.848, 10.849, Partial Differential Equations is the same as that of courses 10.845, 10.846, 10.847, Partial Differential Equations.
<b>10.850 Nonlinear Differential Equations</b>	Prep. 10.844, Advanced Differential Equations Nonlinear differential equations of the first order; systems of differential equations; singular points and stability; second-order nonlinear equations; results of Poincare and Lyapunov; problems in nonlinear mechanics. (Offered 1968, Summer quarter)
<b>10.851 Integral Equations</b>	Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or equivalent (Offered yearly, Winter quarter)
<b>10.852 Integral Equations</b>	Prep. 10.851, Integral Equations (Offered yearly, Spring quarter)
<b>10.853 Integral Equations</b> Credits: 4 quarter hours.	Prep. Advanced calculus (Offered yearly, Spring quarter) The following material is covered in 10.851 and 10.852, Integral Equations. It is also covered as a unit in 10.853, Integral Equations. Integral equations of the first, second, and third kind; systems of orthogonal functions; infinite matrices, infinite linear and bi-linear forms, applications to boundary-value problems.
<b>10.854 Difference Equations</b>	Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or equivalent (Offered yearly, Fall quarter)
<b>10.855 Difference Equations</b>	Prep. 10.854, Difference Equations (Offered yearly, Winter quarter)
The content of 10.854 and 10.855, Difference Equations is the following: Formulation and solution of difference equations; approximate solution of engineering problems by finite-difference methods; relaxation techniques; stability and convergence of approximate methods; applications.	
<b>10.857 Calculus of Variations</b>	Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or equivalent (Offered yearly, Spring quarter)

<b>10.858 Calculus of Variations</b>	Prep. 10.857, Calculus of Variations (Offered 1968-69, Fall quarter)
The content of courses 10.857 and 10.858, Calculus of Variations is as follows: The concept of the first variation of a functional; the simplest variational problem; Euler's equation. Generalization to several variables. Hamilton-Jacobi theory. Sufficient conditions for extrema. Fields of extremals. Direct methods in variational problems.	
<b>10.861 Numerical Analysis</b>	Prep. 10.802 and 10.804, Advanced Mathematics, or linear algebra and advanced calculus Solutions of systems of linear algebraic equations by reduction and iterative methods. Solutions of algebraic and transcendental equations. (Offered yearly, Fall quarter)
<b>10.862 Numerical Analysis</b>	Prep. 10.861, Numerical Analysis Approximation and interpolation. Use of difference techniques in interpolation and quadrature. Approximation by series of orthogonal functions; rational approximation. (Offered yearly, Winter quarter)
<b>10.863 Numerical Analysis</b>	Prep. 10.862, Numerical Analysis Numerical solution of ordinary and partial difference equations, with emphasis on stability and accuracy of solutions. (Offered yearly, Spring quarter)
<b>10.865 Approximation Theory</b>	Prep. Advanced calculus, linear algebra and probability Various techniques for the approximation of given functions, including interpolation, rational approximation, and orthogonal functions. Applications to such problems as numerical integration and solution of differential equations. Credits: 4 quarter hours. (Offered yearly, Winter quarter)
<b>10.871 Matrix Analysis</b>	Prep. 10.802 and 10.804, Advanced Mathematics, or Linear Algebra and Advanced Calculus Solutions of systems of linear equations by direct and iterative methods; matrix inversion, characteristic values, canonical forms. (Offered 1966-67, Winter quarter)
<b>10.872 Matrix Analysis</b>	Prep. 10.871, Matrix Analysis Discussion of Hermitian, orthogonal, and unitary matrices and their physical significance. Functions of matrices and matrix calculus. (Offered 1966-67, Spring quarter)

<b>10.873 Matrix Analysis</b>	Prep. Linear Algebra and Advanced Calculus (Offered yearly, Winter quarter)
Credits: 4 quarter hours.	
This course, offered to day students, embodies the material in 10.871 and 10.872, Matrix Analysis.	
<b>10.876 Tensor Analysis</b>	Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or equivalent Tensor algebra; review of three-dimensional point and vector spaces in the setting of tensor analysis. Linear algebra and n-dimensional affine space. The coordinate tensor, tensor products, invariants, physical components. (Offered 1967-68, Fall quarter)
<b>10.877 Tensor Analysis</b>	Prep. 10.876, Tensor Analysis Symmetric and alternating tensors, rank and support, duality. The metric tensor. Tensor calculus: curvilinear coordinates, tangent spaces. (Offered 1967-68, Winter quarter)
<b>10.878 Tensor Analysis</b>	Prep. 10.877, Tensor Analysis Tensor fields, covariant derivative. Riemannian geometry, geodesics, curvature tensor. Parallel displacement, linear connections, exterior forms. (Offered 1967-68, Spring quarter)
<b>10.901 General Topology</b>	Prep. 10.823, Advanced Calculus or equivalent (Offered yearly, Fall quarter)
<b>10.902 General Topology</b>	Prep. 10.901, General Topology (Offered 1967, Summer quarter) The following material is covered in 10.901 and 10.902, General Topology. Sets and maps, metric spaces, topological spaces, separation axioms, compactness, connectedness.
<b>10.905 Complex Analysis</b>	Prep. Advanced Calculus Analytic functions, conformal mapping, applications to fluid flow and electrostatic potential problems. Credits: 4 quarter hours. (Offered yearly, Fall quarter)
<b>10.906 Complex Analysis</b>	Prep. 10.905, Complex Analysis Integration; further topics in theory, including singularities and residues; and further applications. Credits: 4 quarter hours. (Offered yearly, Spring quarter)
<b>10.907 Algebraic Topology</b>	Prep. 10.913, Theory of Functions of a Real Variable and 10.924, Algebra, or equivalent Credits: 4 quarter hours. (Offered yearly, Fall quarter)

**10.908 Algebraic Topology** Prep. 10.907, Algebraic Topology  
 Credits: 4 quarter hours. (Offered yearly, Winter quarter)

The content of the above two courses is as follows: Homology groups, homology sequences, homotopy theory, fiber spaces, sheaves.

**10.911 Theory of Functions of a Real Variable** Prep. 10.901, General Topology  
 Lebesgue measure on real line, Measurable functions, Lebesgue Integral, convergence theorems, bounded variation, absolute continuity.  
 (Offered yearly, Winter quarter)

**10.912 Theory of Functions of a Real Variable** Prep. 10.911, Theory of Functions of a Real Variable  
 Classical Banach Spaces, integration theory on abstract measure spaces, signed measures, Radon-Nikodym Theorem, Product measure, Fubini Theorem.  
 (Offered yearly, Spring quarter)

**10.913 Theory of Functions of a Real Variable** Prep. Advanced Calculus  
 Sets, relations, Zorn's lemma. Metric and topological spaces. Continuous mappings. Product and quotient spaces. Hausdorff, compact and connected spaces. Complete metric spaces; uniformly continuous mappings. Abstract Integral and measure.  
 Credits: 4 quarter hours. (Offered yearly, Fall quarter)

**10.914 Theory of Functions of a Real Variable** Prep. 10.913, Theory of Functions of a Real Variable  
 Integrable and measurable functions. Product Integral and Fubini's Theorem. Signed integrals; absolute continuity and the Radon-Nikodym Theorem  $L^p$  spaces.  
 Credits: 4 quarter hours. (Offered yearly, Winter and Spring quarters)

**10.915 Theory of Functions of a Complex Variable** Prep. 10.901, General Topology  
 (may be taken concurrently)  
 Geometry of the complex plane, analytic functions, Cauchy's theorem.  
 (Offered yearly, Fall quarter)

**10.916 Theory of Functions of a Complex Variable** Prep. 10.915, Theory of Functions of a Complex Variable  
 Infinite sequences and series, singularities, residues, applications.  
 (Offered yearly, Winter quarter)

**10.917 Theory of Functions of a Complex Variable** Prep. 10.913, Theory of Functions of a Real Variable  
 Credits: 4 quarter hours. (Offered yearly, Fall quarter)

This course, offered to day students, embodies the course content of 10.915 and 10.916, Theory of Functions of a Complex Variable.

<b>10.918 Theory of Functions of a Complex Variable</b>	Prep. 10.916, Theory of Functions of a Complex Variable Meromorphic functions, Mittag-Leffler theorem, conformal mapping. (Offered yearly, Spring quarter)
<b>10.919 Theory of Functions of a Complex Variable</b>	Prep. 10.918, Theory of Functions of a Complex Variable Analytic continuation, Riemann surfaces, doubly periodic functions. (Offered 1966-67, Fall quarter)
<b>10.920 Theory of Functions of a Complex Variable</b>	Prep. 10.917, Theory of Functions of a Complex Variable This course, offered to day students, embodies the material in 10.918 and 10.919, Theory of Functions of a Complex Variable. Credits: 4 quarter hours. (Offered yearly, Winter quarter)
<b>10.921 Advanced Complex Functions</b>	Prep. 10.920, Theory of Functions of a Complex Variable Advanced topics in the theory of functions of a complex variable. Credits: 4 quarter hours. (Offered in alternate years, Spring quarter)
<b>10.924 Algebra</b>	Prep. One semester of modern algebra Credits: 3 quarter hours. (Offered yearly, Fall quarter)
<b>10.925 Algebra</b>	Prep. 10.924, Algebra Credits: 3 quarter hours. (Offered yearly, Winter quarter)
<b>10.926 Algebra</b>	Prep. 10.925, Algebra Credits: 3 quarter hours. The content of courses 10.924, 10.925, 10.926, Algebra is as follows: Group theory, Galois theory, unique factorization domains, Noetherian rings, modules, multilinear algebra.
<b>10.930 Topics in Analysis</b>	Prep. 10.914, Theory of Functions of a Real Variable and Consent of the Instructor Selected advanced topics in analysis. Credits: 4 quarter hours. (Offered in alternate years, Winter quarter)
<b>10.931 Functional Analysis</b>	Prep. 10.914, Theory of Functions of a Real Variable Credits: 4 quarter hours. (Offered yearly, Spring quarter)
<b>10.932 Functional Analysis</b>	Prep. 10.931, Functional Analysis Credits: 4 quarter hours. (Offered in alternate years, Fall quarter) The content of courses 10.931, 10.932, Functional Analysis is as follows: Topological vector spaces, Banach spaces, Hilbert spaces, Banach algebras, algebras of operations; representations.

<b>10.933 Ergodic Theory</b>	Prep. 10.914, Theory of Functions of a Real Variable (Offered in alternate years, Fall quarter)
Credits: 4 quarter hours.	
<b>10.934 Ergodic Theory</b> Prep. 10.933, Ergodic Theory (Offered in alternate years, Winter quarter)	
Credits: 4 quarter hours.	
The content of courses 10.933, 10.934, Ergodic Theory is as follows: Measurable transformations. Ergodic theorems and their generalizations, classification of measure-preserving transformations, entropy and other isomorphism invariants.	
<b>10.935 Advanced Probability Theory</b>	Prep. 10.914, Theory of Functions of a Real Variable
Probability spaces, random variables, distribution functions and characteristic functions. Convergence and stability of sums of independent random variables. Central limit problem. Conditional expectation. Martingales.	
Credits: 4 quarter hours.	(Offered in alternate years, Fall quarter)
<b>10.936 Advanced Stochastic Processes</b>	Prep. 10.935, Advanced Probability Theory
Random walk: classification and limit properties. Hitting probabilities, Markov processes, strong Markov processes, Markov semigroups, sample continuity and diffusion operators.	
Credits: 4 quarter hours.	(Offered in alternate years, Winter quarter)
<b>10.941 Functions of Several Complex Variables</b>	Prep. 10.920, Theory of Functions of a Complex Variable and 10.908, Algebraic Topology
Credits: 3 quarter hours.	(Offered in alternate years, Winter quarter)
<b>10.942 Functions of Several Complex Variables</b>	Prep. 10.941, Functions of Several Complex Variables
Credits: 3 quarter hours.	(Offered in alternate years, Spring quarter)
The content of courses 10.941 and 10.942, Functions of Several Complex Variables is as follows: Holomorphic functions, topology of the space of holomorphic functions, holomorphy domains, Levi convexity theory.	
<b>10.951 Finite Groups</b>	Prep. 10.926, Algebra
Credits: 4 quarter hours.	(Offered in alternate years, Fall quarter)
<b>10.952 Finite Groups</b>	Prep. 10.951, Finite Groups
Credits: 4 quarter hours.	(Offered in alternate years, Winter quarter)
The content of courses 10.951 and 10.952, Finite Groups is as follows: Theory of solvable and nilpotent groups, permutation groups, transfer, p groups, representations of groups, group characters.	

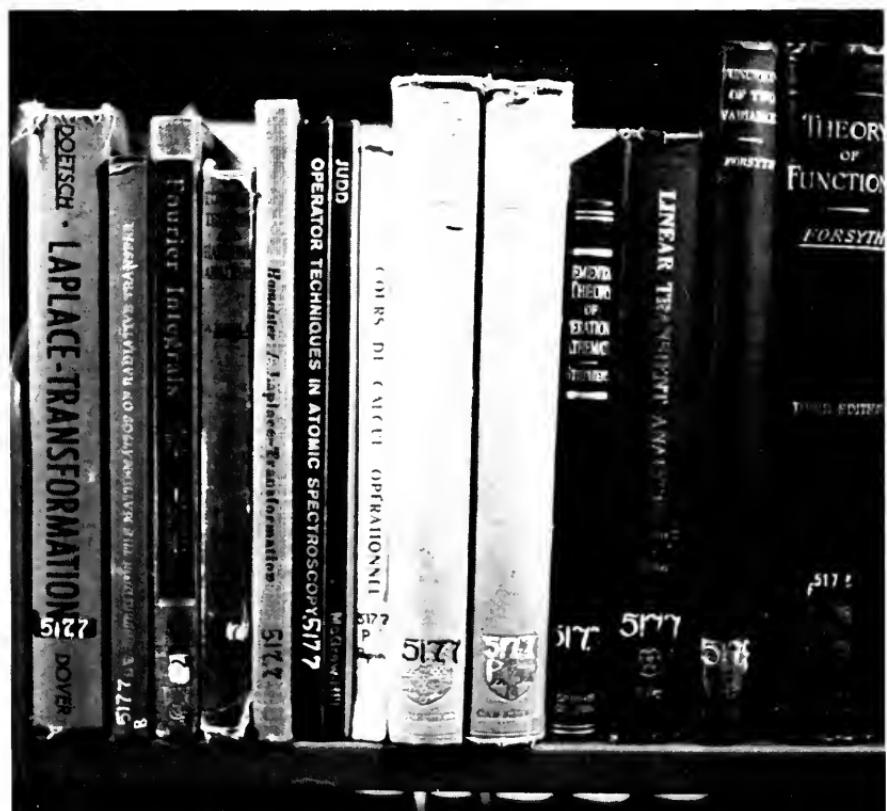
<b>10.953 Lie Algebras</b>	Prep. 10.952, Finite Groups
The structure of semi-simple complex lie algebras.	
Credits: 4 quarter hours.	(Offered in alternate years, Fall quarter)
<b>10.954 Theory of Rings</b>	Prep. 10.926, Algebra
Rings with minimal condition, simple rings, Wedderburn theorem, representation of rings.	
Credits: 4 quarter hours.	(Offered in alternate years, Spring quarter)
<b>10.955 Advanced Lie Algebras</b>	Prep. 10.953, Lie Algebras
Credits: 4 quarter hours.	(Offered in alternate years, Winter quarter)
<b>10.956 Advanced Lie Algebras</b>	Prep. 10.955, Advanced Lie Algebras
Credits: 4 quarter hours.	(Offered in alternate years, Spring quarter)
The content of courses 10.955 and 10.956 is as follows: Advanced topics in the Theory of Lie Algebras.	
<b>10.960 Homological Algebra</b>	Prep. 10.926, Algebra
Topics in homology such as modules, diagrams, functors, complexes, extensions, Ext, Tor, Hom, and the cohomology theory of groups.	
Credits: 4 quarter hours.	(Offered in alternate years, Winter quarter)
<b>10.970 Lie Groups</b>	Prep. 10.913 Theory of Functions of a Real Variable
Analytic manifolds, infinitesimal transformations and differential forms, topological groups, local groups, Lie groups, Lie algebra of a Lie group, exponential mapping, algebra of differential forms, Lie's fundamental theorems, homomorphisms, universal covering group.	
Credits: 4 quarter hours.	(Offered in alternate years, Spring quarter)
<b>10.973 Topological Vector Spaces</b>	Prep. 10.914, Theory of Functions of a Real Variable
Complete metrizable topological vector spaces; Banach-Steinhaus theorem; open mapping theorem. Locally convex topological vector spaces; Hahn-Banach theorem. Duality, weakened topologies. Spaces of continuous linear mappings. Criteria of compactness.	
Credits: 4 quarter hours.	(Offered in alternate years, Winter quarter)
<b>10.976 Differentiable and Analytic Manifolds</b>	Prep. 10.920, Theory of Functions of a Complex Variable and 10.908, Algebraic Topology
Real and complex manifolds, tangent spaces, differential forms, integration.	
Credits: 4 quarter hours.	(Offered in alternate years, Spring quarter)
<b>10.990 Seminar</b>	Prep. Consent of the department
Investigation of selected topics through the study of journal articles.	
	(Offered yearly, Spring and Summer quarters)

**10.992 Readings in Analysis** Prep. Consent of the department  
Supervised reading in selected topics in analysis.  
Credits: 4 quarter hours.  
(Offered yearly, Fall, Winter, and Spring quarters)

**10.993 Readings in Algebra** Prep. Consent of the department  
Supervised reading in selected topics in algebra.  
Credits: 4 quarter hours.  
(Offered yearly, Fall, Winter, and Spring quarters)

**10.994 Readings in Topology** Prep. Consent of the department  
Supervised reading in selected topics in topology.  
Credits: 4 quarter hours.  
(Offered yearly, Fall, Winter, and Spring quarters)

**10.995 Doctoral Thesis** Prep. Admission to Ph.D. program  
(Offered yearly, every quarter)



# *Physics*

## Admission

To be enrolled for graduate work in physics, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included 12 semester hours of physics beyond general physics, and mathematics through differential equations.

## THE MASTER'S DEGREE

### Program

Forty-two quarter hours of academic credit are required. The registration of full-time students will be approved by a faculty advisor. If deficiencies in the student's background exists, registration in advanced undergraduate courses may be required.

A thesis option is available for a full-time student with the approval of the department. If approved, a thesis carries six quarter hours of credit.

The program may be completed on a part-time evening basis, and the student may progress according to his ability and time available.

All students will be required to successfully complete the required courses as listed below. The remainder of the program may be satisfied by taking elective courses.

	Credits
Mathematical Physics 11.811, 11.812, and 11.813 or 11.814 and 11.815	6
Classical Mechanics 11.821, 11.822, and 11.823 or 11.824 and 11.826	6
Electromagnetic Theory 11.831, 11.832, and 11.833 or 11.834 and 11.835	6
Quantum Theory 11.841, 11.842, and 11.843 . . . . .	<span style="float: left;">12</span> <span style="float: right;">30</span>

### Electives

In addition to these 30 quarter hours of required courses, 12 more quarter hours must be taken. These may be elected from any course in physics, mathematics, engineering, or biology, for which the student has the necessary preparation.

## THE DOCTOR OF PHILOSOPHY DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Physics.

### Admission

Students admitted to full-time study in physics are eligible to take the qualifying examination in accordance with the information given under the heading of Qualifying Examination.

Students enrolled in the evening part-time master's degree program, who wish to qualify for Ph.D. candidacy, may so indicate by petition to the Graduate Committee of the Physics Department. The petition should be a letter containing a timetable for the taking of qualifying examinations and a course plan for completing 42 quarter hours of graduate study.

### Residence Requirements

After a student has completed 42 quarter hours of course work and has passed his qualifying examination, he becomes a doctoral degree candidate and must satisfy the residence requirement by one full year of full-time graduate work.

### Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

### Qualifying Examination

The Qualifying Examination consists of a written and an oral part. Only students with an adequate score on the written examination will be permitted to take the oral. The written part covers the fields of mechanics, electricity, and magnetism, modern physics, optics, and thermodynamics. These examinations are given twice a year, once in October and once in February. All students must take these examinations by the fourth quarter of their registration for graduate work. If the examination is failed, the student is allowed to repeat the examination the next time it is given, no later than the sixth quarter. A student entering with 15 semester hours or more of graduate work taken in some other institution must take the qualifying examination in his first quarter of registration. If the examination is failed, the student may repeat it the next time it is given. All students intending to take the Qualifying Examination should notify the Department by the middle of September or the first of February. No student will be permitted to continue his work toward a Ph.D. who has not passed the qualifying examination by the end of his second year at Northeastern (by the end of the first year for transfer students with 15 semester hours). Copies of past qualifying examinations are kept in the Physics Library.

### Comprehensive Examination

The Comprehensive Examination consists of a written and an oral part. Only students with an adequate score on the written examination will be permitted to take the oral. The written part lasts two days. The first day covers the fields of classical mechanics, quantum mechanics, and electromagnetic theory. On the second day, students select questions from the field of thermodynamics, statistical mechanics, plasma physics, nuclear physics, elementary particles, solid state, and special relativity. Some of these questions will be based on recent departmental colloquia. These examinations are given twice a year, once in October and once in February. A student must satisfy the language requirements for one foreign language before he may take the Comprehensive. Copies of past comprehensive examinations are kept in the Physics Library.

A student must take these examinations during the next fall quarter following the quarter in which he passed the qualifying examination. If the examination is failed, it may be repeated the next time it is given. No student will be permitted to continue his graduate program who has not passed the comprehensive examination by the end of the first academic year following the year in which he passed the qualifying examination.

Exceptions of these rules may be made under very unusual circumstances. A written request should be sent to the Department Chairman and will be acted on by the Departmental Graduate Committee.

### Course Requirements

The course requirements, in addition to the minimum requirement of forty-two quarter hours credit, are established by the Departmental Graduate Committee for each candidate.

### Thesis

The student should have made arrangements for a thesis adviser by the time he wishes to take the oral part of the comprehensive examination. An outline of the thesis must be approved by the Departmental Graduate Committee at least eight months before the final oral examination.

Details of the method of obtaining a thesis adviser and of the procedure for submitting the outline will be given to the student by the department.

### Language Requirements

Competence must be demonstrated in two foreign languages, at least one of which is chosen from among French, German and Russian. Competence in one language will be assured if that language was studied for a year or more and passed in college or if it is the candidate's native language, but competence in one language from among French, German, and Russian must be demonstrated by passing an examination as specified by the Departmental Language Committee. Competence in one language must be demonstrated before the comprehensive examination is taken.

**Final Oral Examination**

This examination will be held in accordance with the Graduate Division regulations.

**DESCRIPTION OF COURSES**

<b>11.801 Introductory Modern Physics I</b>	Prep. Admission to science or engineering graduate program (Offered yearly, Fall quarter)
Credits: 2 quarter hours.	
<b>11.802 Introductory Modern Physics II</b>	Prep. 11.801, Introductory Modern Physics I (Offered yearly, Winter quarter)
Credits: 2 quarter hours.	
<b>11.803 Introductory Modern Physics III</b>	Prep. 11.802, Introductory Modern Physics II
The courses in Introductory Modern Physics carry graduate credit, but may not be used in satisfying the stated requirements for the master's degree in physics.	
The content of the above three courses is a study of the breakdowns of the classical laws of physics, review of important twentieth-century experiments showing the quantum aspects of radiation and matter, introduction to special relativity, the discovery of the electron, the nuclear atom, the radiation paradox, the Bohr theory of hydrogen and the inner shells of heavy atoms, wave aspects of matter, and Schroedinger's wave mechanics.	
Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.811 Mathematical Physics</b>	Prep. Admission to science or engineering graduate program (Offered yearly, Fall quarter)
Credits: 2 quarter hours.	
<b>11.812 Mathematical Physics</b>	Prep. 11.811, Mathematical Physics (Offered yearly, Winter quarter)
Credits: 2 quarter hours.	
<b>11.813 Mathematical Physics</b>	Prep. 11.812, Mathematical Physics
The content of the above three courses is an introduction to mathematical methods of theoretical physics. Topics to be covered include vector spaces, eigenfunction expansions, special functions of mathematical physics, theory of functions of a complex variable, differential and integral equations, generalized functions, Green's functions, partial differential equations, perturbation theory, and selected applications.	
Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.814 Mathematical Physics</b>	Prep. Admission to science or engineering graduate program (Offered yearly, Fall quarter)
Credits: 4 quarter hours.	

<b>11.815 Mathematical Physics</b>	Prep. 11.814, Mathematical Physics These two courses cover essentially the same material as 11.811, 11.812, and 11.813 Mathematical Physics. Credits: 3 quarter hours.	(Offered yearly, Winter quarter)
<b>11.821 Classical Mechanics</b>	Prep. Admission to science or engineering graduate program Credits: 2 quarter hours.	(Offered yearly, Fall quarter)
<b>11.822 Classical Mechanics</b>	Prep. 11.821, Classical Mechanics Credits: 2 quarter hours.	(Offered yearly, Winter quarter)
<b>11.823 Classical Mechanics</b>	Prep. 11.822, Classical Mechanics The content of the above three courses is Newton's laws of motion, constraints and D'Alembert's principles, Lagrange's equations, Hamilton's variational principle, central force motion, Hamilton's canonical equations, coupled oscillations, rigid body motion, Hamiltonian formulation of mechanics, canonical transformations, Hamilton-Jacobi theory, action-angle variables, classical perturbation theory. Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.824 Classical Mechanics</b>	Prep. Admission to science or engineering graduate program Credits: 3 quarter hours.	(Offered yearly, Fall quarter)
<b>11.826 Classical Mechanics</b>	Prep. 11.824, Classical Mechanics The content of the above two courses is essentially the same as 11.821, 11.822, 11.823 Classical Mechanics. Credits: 3 quarter hours.	(Offered yearly, Spring quarter)
<b>11.827 Statistical Mechanics</b>	Prep. 11.843, Quantum Theory III (may be taken concurrently) Credits: 3 quarter hours.	(Offered 1968-69, Fall quarter)
<b>11.828 Statistical Mechanics</b>	Prep. 11.827, Statistical Mechanics Credits: 3 quarter hours.	(Offered 1968-69, Winter quarter)
<b>11.829 Statistical Mechanics</b>	Prep. 11.828, Statistical Mechanics The content of the above three courses is a study of the basics of thermodynamics, density matrix and partition function for the canonical and grand canonical ensembles and their connection with thermodynamic functions, application to specific examples, fluctuations, and irreversible processes. Credits: 3 quarter hours.	(Offered 1968-69, Spring quarter)
<b>11.831 Electromagnetic Theory</b>	Prep. Admission to science or engineering graduate program Credits: 2 quarter hours.	(Offered yearly, Fall quarter)
<b>11.832 Electromagnetic Theory</b>	Prep. 11.831, Electromagnetic Theory Credits: 2 quarter hours.	(Offered yearly, Winter quarter)

<b>11.833 Electromagnetic Theory</b>	Prep. 11.832, Electromagnetic Theory The content of the above three courses is electrostatics, boundary value problems, Green's functions and orthogonal function expansion, electrostatics of dielectric media, magnetostatics, time varying fields, Maxwell's equations, energy and momentum of the electromagnetic field, boundary conditions, plane waves, Fourier analysis, radiation of electromagnetic waves.
Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.834 Electromagnetic Theory</b>	Prep. Admission to science or engineering graduate program (Offered yearly, Fall quarter)
Credits: 3 quarter hours.	
<b>11.835 Electromagnetic Theory</b>	Prep. 11.834, Electromagnetic Theory The content of the above two courses is the same as 11.831, 11.832, 11.833, Electromagnetic Theory.
Credits: 3 quarter hours.	(Offered yearly, Winter quarter)
<b>11.836 Electromagnetic Theory</b>	Prep. 11.835, Electromagnetic Theory Irreducible multipole expansion of the electromagnetic field; introduction to special relativity, radiation from high-speed particles.
Credits: 3 quarter hours.	(Offered yearly, Spring quarter)
<b>11.837 Electromagnetic Theory</b>	Prep. 11.836, Electromagnetic Theory Advanced topics in electromagnetic theory such as problems involving radiation reaction, energy, momentum and the equations of motion of a high-speed particle, Cerenkov radiation, the Lagrangian and Hamiltonian formulation of electromagnetism.
Credits: 3 quarter hours.	(Offered 1968-69, Fall quarter)
<b>11.838 General Relativity I</b>	Prep. 11.837, Electromagnetic Theory and 11.823 or 11.826, Classical Mechanics
Credits: 3 quarter hours.	(Offered 1968-69, Winter quarter)
<b>11.839 General Relativity II</b>	Prep. 11.838, General Relativity I The content of the above two courses is a brief survey of differential geometry, physical basis of the Einstein equations, simple solutions and experimental tests, cosmology, asymptotic properties of the Einstein equations (radiation, energy, momentum), quantization of the theory.
Credits: 3 quarter hours.	(Offered 1968-69, Spring quarter)
<b>11.841 Quantum Theory I</b>	Prep. 11.821 or 11.824, Classical Mechanics and 11.813 or 11.815 Mathematical Physics (may be taken concurrently)
Experimental basis of quantum theory, Schroedinger equations and probability interpretation. Uncertainty principle, one dimensional problems, operator methods for harmonic oscillator, orbital angular momentum, central force problem.	
Credits: 4 quarter hours.	(Offered yearly, Fall and Winter quarters)

**11.842 Quantum Theory II**      Prep. 11.841, Quantum Theory I and  
     11.823 or 11.826, Classical Mechanics  
     (may be taken concurrently)  
 Scattering problems, Born approximation, plane shift analysis, introduction to S-matrix theory, general vector space formulation of quantum mechanics.  
 Credits: 4 quarter hours.      (Offered yearly, Winter and Spring quarters)

**11.843 Quantum Theory III**      Prep. 11.842, Quantum Theory II  
 Time independent perturbation theory (non-degenerate and degenerate), time dependent perturbation theory, semi-classical theory of radiation, Pauli wave equation.  
 Credits: 4 quarter hours.      (Offered yearly, Fall and Spring quarters)

**11.844 Quantum Theory IV**      Prep. 11.843, Quantum Theory III  
 Credits: 3 quarter hours.      (Offered yearly, Winter quarter)

**11.845 Quantum Theory V**      Prep. 11.844, Quantum Theory IV  
 The above two courses provide a study of the special topics in non-relativistic and relativistic quantum mechanics, Dirac wave equations, addition of angular momentum problems.  
 Credits: 3 quarter hours.      (Offered yearly, Spring quarter)

**11.851 Plasma Physics I**      Prep. 11.832, Electromagnetic Theory  
 Motion of charged particles in electromagnetic fields, propagation of electromagnetic waves in ionized gases, elementary theory of plasma, Boltzmann equation for plasma, fundamentals of magnetohydrodynamics.  
 Credits: 2 quarter hours.      (Offered 1967-68, Fall quarter)

**11.852 Plasma Physics II**      Prep. 11.851, Plasma Physics I  
 Application of MHD to plasma confinement, motions of plasma across and along magnetic lines of force, plasma oscillations, waves in magnetoplasma, dispersion relations, nonlinearities in plasma.  
 Credits: 2 quarter hours.      (Offered 1967-68, Winter quarter)

**11.853 Plasma Physics III**      Prep. 11.852, Plasma Physics II  
 Fodder-Planck equations for plasma, plasma conductivity, run-away electrons, relaxation times, radiation from plasma, stability theories, relativistic plasma.  
 Credits: 2 quarter hours.      (Offered 1967-68, Spring quarter)

**11.861 Introductory Nuclear Physics I**      Prep. A one-year  
     (undergraduate) course in modern  
     (atomic and nuclear) physics  
 Basic description of nuclei, radioactivity, nuclear detectors.  
 Credits: 2 quarter hours.      (Offered yearly, Fall quarter)

**11.862 Introductory Nuclear Physics II**      Prep. 11.861, Introductory  
     Nuclear Physics I  
 Static properties of nuclei, nuclear models, nuclear transitions.  
 Credits: 2 quarter hours.      (Offered yearly, Winter quarter)

<b>11.863 Introductory Nuclear Physics III</b>	Prep. 11.862, Introductory Nuclear Physics II
Nuclear reactions, high-energy physics, elementary particles.	
Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.864 Theoretical Nuclear Physics I</b>	Prep. 11.843, Quantum Theory III (may be taken concurrently)
Theoretical interpretation of the experimental data concerning the nucleon-nucleon interaction. Topics such as the variety of nucleon-nucleon scattering experiments, phase shift analysis, potential and other phenomenological models, and meson theory will be discussed.	
Credits: 3 quarter hours.	(Offered 1967-68, Fall quarter)
<b>11.865 Theoretical Nuclear Physics II</b>	Prep. 11.864, Theoretical Nuclear Physics I
Nuclear models. The shell model, the collective model and the optical model will be considered.	
Credits: 3 quarter hours.	(Offered 1967-68, Winter quarter)
<b>11.866 Theoretical Nuclear Physics III</b>	Prep. 11.865, Theoretical Nuclear Physics II
Special topics which may vary from year to year, such as beta-decay, nuclear reactions, electromagnetic interactions with nuclei and high energy scattering phenomena.	
Credits: 3 quarter hours.	(Offered 1967-68, Spring quarter)
<b>11.871 Introductory Solid-State Physics I</b>	Prep. A one-year (undergraduate) course in modern (atomic and nuclear) physics
An introduction to the electrical and magnetic properties of matter.	
Credits: 2 quarter hours.	(Offered yearly, Fall quarter)
<b>11.872 Introductory Solid-State Physics II</b>	Prep. 11.871, Introductory Solid State Physics I
A continuation of the electrical and magnetic properties plus the optical properties of matter.	
Credits: 2 quarter hours.	(Offered yearly, Winter quarter)
<b>11.873 Introductory Solid-State Physics III</b>	Prep. 11.872, Introductory Solid State Physics II
The thermal properties of matter.	
Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.874 Solid-State Physics I</b>	Prep. 11.843, Quantum Theory III (may be taken concurrently)
Selected topic in the quantum theory of solids. The band theory of metals.	
Credits: 3 quarter hours.	(Offered 1967-68, Fall quarter)

<b>11.875 Solid-State Physics II</b>	Prep. 11.874, Solid State Physics I A continuation of the band theory of metals plus semi-conduction and ionic crystals. Credits: 3 quarter hours.	(Offered 1967-68, Winter quarter)
<b>11.876 Solid-State Physics III</b>	Prep. 11.875, Solid State Physics II Electric, magnetic and thermal properties of matter. Credits: 3 quarter hours.	(Offered 1967-68, Spring quarter)
<b>11.881 Quantum Theory of Fields I</b>	Prep. 11.836, Electromagnetic Theory and 11.844, Quantum Theory IV (may be taken concurrently) Credits: 3 quarter hours.	(Offered 1967-68, Winter quarter)
<b>11.882 Quantum Theory of Fields II</b>	Prep. 11.881, Quantum Theory of Fields I and 11.845, Quantum Theory V (may be taken concurrently) Credits: 3 quarter hours.	(Offered 1967-68, Spring quarter)
<b>11.883 Quantum Theory of Fields III</b>	Prep. 11.882, Quantum Theory of Fields II The content of the above three courses provide a study of the quantum mechanical one-particle wave equations for electrons, nucleons, neutrinos and mesons, symmetric and antisymmetric multiparticle systems, second quantization, free relativistic boson fields, fermion fields and electromagnetic fields, relation to the description of various elementary particles, theory of interacting fields and particles, formal scattering theory, Feynman diagrams, renormalization procedures, application to scattering, production and decay phenomena, quantum electrodynamic effects, recent formal developments. Credits: 3 quarter hours.	(Offered 1968-69, Fall quarter)
<b>11.884 Particle Physics I</b>	Prep. 11.845, Quantum Theory V (may be taken concurrently) Credits: 3 quarter hours.	(Offered 1968-69, Winter quarter)
<b>11.885 Particle Physics II</b>	Prep. 11.884, Particle Physics I (Offered 1968-69, Spring quarter)	Credits: 3 quarter hours.
<b>11.886 Particle Physics III</b>	Prep. 11.885, Particle Physics II The content of the above three courses is a discussion of the properties of baryons, meson, leptons, and resonant states. The general phenomenological framework of the fundamental interaction between elementary particles. The implication of relativistic covariance, unitarity, analyticity, invariance and conservation laws. (Some knowledge of elementary quantum field theory is desirable but not required.) Credits: 3 quarter hours.	(Offered 1967-68, Fall quarter)
<b>11.990 Special Topics in Physics</b>	Prep. Consent of the instructor A discussion of special topics in physics to be chosen by the instructor. Credits: from 1 to 4 quarter hours.	(Offered yearly)

**11.991 Master's Thesis**

Experimental and theoretical work for master's degree.

Credits: 6 quarter hours.

(Offered yearly)

**11.992 Special Problems in Physics** Prep. Consent of faculty member

Theoretical or experimental work under individual faculty supervision.

Credits: from 1 to 4 quarter hours.

(Offered yearly)

**11.995 Doctoral Thesis** Prep. Admission to Ph.D. program

Experimental and theoretical work for Ph.D. candidates.

(Offered yearly)



# *Political Science*

## Admission

To be enrolled for graduate work in political science, applicants must have obtained a bachelor's degree from a recognized institution with an undergraduate program which included at least 15 semester hours of political science or government courses.

## THE MASTER'S DEGREE

### Program

Forty-two quarter hour credits of academic work are required. With the approval of the faculty advisor, a maximum of nine quarter hours may be elected from graduate courses in other departments and a maximum of nine quarter hours may be elected from advanced undergraduate courses.

A thesis is optional with the approval of the chairman of the department. If approved, a thesis carries six quarter hours of credit.

### Comprehensive Examination

This examination will be held in accordance with the general Graduate Division regulations. Two major fields of political science will be covered as directed by the Departmental Committee on Graduate Studies.

### Language or Statistics Requirement

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, or in statistics, specified by the department.

## DESCRIPTION OF COURSES

All courses carry three quarter hour credits unless otherwise specified.

### 22.800 Seminar in American Government

Analysis in depth of selected problems in American Government. Examples of problems are: transition of American Political Parties, legislative reapportionments, and the decline of Congress as a law-making body.  
(Fall quarter)

### 22.820 Federal Legislative Process

Study of Congress and of the influence of President, administrative bureaucracy, parties, interest groups, and public opinion on the development of legislative policy.  
(Offered 1968-69, Fall quarter)

### 22.824 The Presidency

Examination of the place and function of the chief executive in the formulation and execution of public policy.  
(Offered 1968-69, Winter quarter)

**22.828 The Judiciary**

Analysis of the role of the judiciary in the American governmental process. Special attention is given to those areas of constitutional law where the Court's decisions have a profound impact on the basic structure of American politics: (apportionment, economic regulation, federalism, etc.)

(Offered 1968-69, Spring quarter)

**22.830 Civil Rights**

Examination of the doctrine of Constitutionalism illustrated and amplified by a study of the substance and process of the Bill of Rights as developed in decisions of Federal courts, and Congressional enactments.

(Offered 1967-68, Winter quarter)

**22.832 Intergovernmental Relations**

An institutional-behavioral analysis of the changing relationship between the various levels of American government — national, state and local — relating the pattern of change to the social and economic forces which underlie it.

(Offered 1967-68, Spring quarter)

**22.840 Problems in State Government**

Appraisal of the problems of contemporary state government in the U.S. Particular emphasis is given to the state government of Massachusetts. Individual research is stressed.

(Offered 1968-69, Fall quarter)

**22.844 Urban Government**

The contemporary crisis in urban government — problems of political independence, government finance and administration, rapid growth of suburban and metropolitan areas, and decline and decay of the core city are stressed. Particular emphasis is given to the Boston metropolitan area. Individual research is stressed.

(Offered 1967-68, Winter quarter)

**22.845 Seminar in Problems of Municipal Administration**

Selected case problems and topics in municipal administration; including organization, financial management, personnel and labor relations, municipal services, and public and political relations. Individual research is stressed.

(Offered 1968-69, Winter quarter)

**22.846 Seminar in Problems of Regional and Urban Development**

An examination of the role of government and politics in the planning, programming, and administration of regional and urban development in the United States. Consideration is given to urban renewal; inter-urban and inter-regional competition; interstate compacts; public authorities; T.V.A., Appalachia, and New England regional development; anti-poverty programs; and conflicts between public and private interests. Individual research is stressed.

(Offered 1967-68, Spring quarter)

**22.850 Seminar: Comparative Politics I**

Comparative analysis of politics and political systems with special attention to fundamental problems of theory and practice. The chief focus is on contemporary political systems and contemporary theories in the field of comparative politics. Traditional models are also treated, but more briefly. Particular attention will be paid to British and American political experience.

(Offered 1968-69, Fall quarter)

**22.851 Seminar: Comparative Politics II**Prep. 22.850, Seminar:  
Comparative Politics I

Extends and intensifies the comparative analysis of politics undertaken in Comparative Politics I by examining a broader range of institutional experience. Special attention will be given to European political experience, particularly that of France and Germany.

(Offered 1968-69, Winter quarter)

**22.854 Seminar: Totalitarianism**

An analysis of totalitarianism and dictatorship, including study of historical background, fundamental characteristics, theories of origin, nature, and significance, and evaluation of techniques, ideologies, policies, and instruments of power. Special attention will be given to the government and politics of the Soviet Union.

(Offered 1968-69, Spring quarter)

**22.880 Seminar in Public Administration**

Selected topics in public administration with special emphasis upon the problems of relating politics and administration in the development of public policy.

(Offered 1967-68, Fall quarter)

**22.900 Ancient and Medieval Political Thought**

The development of political thought from Greek antiquity to the end of the Middle Ages. Both historical and analytical approaches will be utilized. Attention is also paid to the cultural, social, and intellectual context within which political theories develop.

(Offered 1967-68, Fall quarter)

**22.910 Modern Political Thought**

Examination of political thought from Machiavelli to Marx.

(Offered 1967-68, Winter quarter)

**22.920 Contemporary Political Theory**

The main currents of political thought in the latter half of the nineteenth and the twentieth centuries with special emphasis on the relations between political theory, philosophy and political science.

(Offered 1967-68, Spring quarter)

**22.926 Seminar in American Political Thought**

Examination of selected intellectual movements that have informed and influenced American political life.

(Offered 1968-69, Spring quarter)

**22.944 Seminar in Nationalism**

The evolution and role of nationalism in both theory and practice. Representative nationalistic movements and theories are analyzed.

(Offered 1967-68, Winter quarter)

**22.946 Seminar: The Politics of Revolution and Change**

Analysis of the nature of political change with attention to both theory and practice. Topics discussed are revolution, major trends in contemporary politics, and the relationship between political change and technological, scientific, or social change.

(Offered 1967-68, Spring quarter)

**22.948 Government and Politics of North Africa and the Middle East**

Comparative analysis of the political systems and foreign policies of African states north of the Sahara. Also stressed is the relationship of this area with the Middle East. (Offered 1967-68, Spring quarter)

**22.950 United States — Soviet Relations**

The relations between the United States and the Soviet Union from 1917 to the present. Topics stressed are: the "non recognition" period, the breakdown of the World War II "Grand Alliance," and the nature of the present power conflict. (Offered 1967-68, Fall quarter)

**22.952 Communist China's Foreign Policy**

A study of the Peking government's relations with Afro-Asia, the Soviet orbit, and the West. Attention is given to policy objectives, strategy, tactics, and the method of decision-making in both the party and state apparatus. (Offered 1968-69, Spring quarter)

**22.954 Soviet Relations with Eastern Europe**

An analysis of Soviet policy in Eastern Europe, especially Russian efforts after World War II to develop Communism and maintain a position of pre-eminence in this region. (Offered 1968-69, Fall quarter)

**22.956 Government and Politics in Sub-Saharan Africa**

Comparative analysis of the political systems and foreign policies of selected African states south of the Sahara. Special attention is given to the Republic of South Africa and its policy of apartheid.

(Offered 1968-69, Spring quarter)

**22.958 The Formulation and Conduct of American Foreign Policy**

The governmental mechanism for foreign policy formulation and its conduct. Problems in decision-making and execution are emphasized. (Offered 1968-69, Winter quarter)

**22.959 Seminar in American Foreign Policy**

Examination in depth of selected issues concerning the role of the United States in world affairs since 1945. (Offered 1968-69, Fall quarter)

**22.960 Problems of World Order I**

Emphasizes such topics as appraisal of diverse systems of public order, approaches of international law and international organization to the problem of world order, and the problem of world peace enforcement.

(Offered 1967-68, Fall quarter)

**22.961 Problems of World Order II**

Continuation of 22.960 Problems of World Order I, in which political problems of world order are stressed. Representative topics considered are arms control, disarmament, strengthening the United Nations and evaluation of world government proposals.

(Offered 1967-68, Winter quarter)

**22.990 Assigned Reading**

Assigned reading under supervision of a faculty member.  
Credit to be assigned.

**22.991 Thesis**

Thesis supervision by individual members of the department.  
Credits: 6 quarter hours.

# *Psychology*

## Admission

To be enrolled for graduate work in psychology, applicants must have obtained a bachelor's degree from a recognized institution in an undergraduate program which included at least 15 semester hours of psychology, including experimental psychology and statistics. All applicants must take the Graduate Record Examination. The Miller Analogy Test is desirable, but not required.

## THE MASTER'S DEGREE

### Full-Time Program

Forty-two quarter hour credits of academic work are required. With the approval of the faculty advisor, a student may elect advanced undergraduate courses in psychology and graduate courses in other departments.

The student must select one of the following options:

- A thesis for 6 quarter hour credits. An oral examination on the thesis and general psychology will be required.
- Research Problems for 6 quarter hour credits and written doctoral qualifying examinations.

The graduate program will normally be taken in accordance with the following pattern:

### FIRST YEAR

Fall Quarter	Credits	Winter Quarter	Credits
19.826 Perceptual Processes .....	2	19.840 Physiological Psychology I or	
19.801 Statistics I .....	2	19.901 Personality Theory .	2
19.823 Conditioning .....	<u>2</u>	19.802 Statistics II .....	3
	<u>6</u>	19.824 Human Learning ...	<u>2</u>
			<u>7</u>

Spring Quarter	Credits	Summer Quarter	Credits
19.841 Physiological Psychology II or		Thesis or	
19.902 Personality Theory .	2	Research Problems .....	6
19.803 Statistics III .....	3		
19.825 Cognitive Processes	<u>2</u>		
	<u>7</u>		

**SECOND YEAR**

<b>Fall Quarter</b>	<b>Credits</b>	<b>Winter Quarter</b>	<b>Credits</b>
19.820 Sensory Processes . . . . .	2	19.821 Advanced Experimental Psychology I . . . . .	2
19.920 Social Psychology . . . . .	2	19.840 Physiological Psychology I or	
Elective . . . . .	<u>2</u>	19.901 Personality Theory . . . . .	2
	<u>6</u>	19.850 History . . . . .	<u>2</u>
			<u>6</u>

<b>Spring Quarter</b>	<b>Credits</b>
19.822 Advanced Experimental Psychology II . . . . .	2
19.841 Physiological Psychology II or	
19.902 Personality Theory . . . . .	2
Elective . . . . .	<u>2</u>
	<u>6</u>

**Language Requirement**

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language to be specified by the Department.

**Part-Time Program**

Admission requirements are the same as for the full-time program, but students may progress at their own pace. The required courses are the same as those for the full-time program. Included in the first three graduate course registrations must be the following courses to be taken in the quarter when they are offered:

		<b>Credits</b>
19.801 Statistics I . . . . .		2
19.802 Statistics II . . . . .		3
19.803 Statistics III . . . . .		3
19.826 Perceptual Processes . . . . .		2
19.840 Physiological Psychology I . . . . .		2
19.841 Physiological Psychology II . . . . .		2

## THE DOCTOR'S DEGREE

### Admission

Applicants may apply for admission to the doctoral program in February of the year in which they expect to complete the requirements for the master's degree. Students enrolled at Northeastern University must submit transcripts of their undergraduate work and of graduate work that has been completed. Students enrolled at other institutions must submit three letters of recommendation in addition to the necessary transcripts.

### Residence Requirement

The residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work. However, a student should expect to spend at least two years or the equivalent in full-time graduate study beyond the requirements of the master's degree.

### Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

### Qualifying Examination

Students must pass a qualifying examination early in the period of doctoral study. The qualifying examination is given in four parts covering statistics, general psychology, experimental psychology, and a choice of social psychology, personality or physiological psychology.

The examinations are given in April and applicants may take the examination if they expect to complete the master's degree requirements the following June. Students entering the doctoral program with a master's degree from another university will normally take the qualifying examination in April of the first year of doctoral study. The examination in any field may be repeated once with the approval of the Departmental Graduate Committee. A maximum of 18 hours of doctoral work may be taken before the qualifying examination is passed.

### Comprehensive Examination

During the period of doctoral degree candidacy, each student must pass a comprehensive examination in the area of his specialty. This examination must be passed at least nine months before the June in which the Ph.D. degree is to be awarded.

### Course Requirements

A minimum of 39 quarter hours of academic work is required beyond the requirements for the master's degree. The particular courses will be approved by the advisor and the Departmental Graduate Committee. Students may be required to take certain basic courses before proceeding to the necessary doctoral courses.

A maximum of 18 quarter hours of work may be taken from approved courses in other graduate departments. The remainder of the work will be taken in advanced seminars in specialized psychology areas.

### **Thesis**

A student may start his thesis work during his first year of the doctoral program although, in some cases, he may be required to complete a specified amount of course work before starting the thesis. In either case, a thesis committee will be appointed by the Chairman of the Department upon the recommendation of the Departmental Graduate Committee. The thesis committee will be responsible for initial approval of the thesis in its final form.

### **Language Requirement**

A reading knowledge of one foreign language is required. Normally the language selected will be French, German, or Russian. Other languages may be selected by petition to the Departmental Graduate Committee. Proficiency in a language shall be determined in a manner prescribed by the Departmental Graduate Committee. The language requirement must be satisfied no later than six months before the time at which the Ph.D. degree is to be conferred.

### **Final Oral Examination**

The final oral examination is taken after completion of all other requirements for the degree. This examination will not be held until at least two weeks after the thesis has been accepted by the Departmental Graduate Committee and must be passed at least two weeks before the commencement at which the degree is to be awarded.

The final oral examination will deal with the subject matter of the doctoral thesis, significant developments in the field of the thesis work, and subject matter as required by the examining committee.

## **DESCRIPTION OF COURSES**

All courses carry two quarter hour credits unless otherwise specified.

### **19.801 Statistics I**

A thorough review of basic descriptive and predictive statistics, emphasizing the choice of appropriate statistical models for various scales of measurement. Psychology graduate students may be exempted from this course by passing an examination which is administered during the first week of classes.

No credit toward M.A. degree in psychology. (Offered yearly, Fall quarter)

**19.802 Statistics II** Prep. 19.801, or equivalent  
 Expanded and more detailed exposition of materials presented in 19.801.  
 Curvilinear regression, correlational techniques for non-additive data, set theory approach to predictive statistics, non-parameter statistics, multiple comparisons, and introduction to the analysis of variance for mixed designs.  
 Credits: 3 quarter hours. (Offered yearly, Winter quarter)

**19.803 Statistics III** Prep. 19.802  
 Theory and practice of test construction, emphasizing quantitative theories of testing. Item analysis and a thorough analysis of the concepts of reliability and validity.  
 Credits: 3 quarter hours. (Offered yearly, Spring quarter)

**19.804 Experimental Design I** Prep. Admission to doctoral candidacy or permission by instructor  
 Various experimental designs and their appropriate analyses; analysis of covariance.  
 Credits: 3 quarter hours. (Offered 1967-68, Fall quarter)

**19.805 Experimental Design II** Prep. Admission to doctoral candidacy or permission by instructor  
 Orthogonal designs, multi-variate analysis; tests after analysis of variance, multiple mean difference tests and trend analysis.  
 Credits: 3 quarter hours. (Offered 1967-68, Winter quarter)

**19.806 Psychological Scaling** Prep. Admission to doctoral candidacy or permission by instructor  
 Measurement theory, psychophysical methods, examples of various scales used in psychology. Attention will be given to the problems of comparing physiological and psychological data.  
 Credits: 3 quarter hours. (Offered 1967-68, Spring quarter)

**19.807 Mathematical Models** Prep. Admission to doctoral candidacy or permission by instructor  
 Several theories which generate quantitative predictions of behavior are presented.  
 Credits: 3 quarter hours. (Offered 1967-68)

**19.820 Sensory Processes** Prep. Undergraduate course in experimental psychology including work in audition and vision  
 After a careful review of the basic facts of audition and vision, psychophysical problems common to both senses will be investigated. Recent journal articles will provide primary source materials for assigned readings and for class reports.  
 (Offered 1967-68, Fall quarter)

<b>19.821 Advanced Experimental Psychology I</b>	Prep. 19.820, Sensory Processes
A series of measurements of simple phenomena in hearing and vision will be conducted to acquaint the student with experimental techniques and procedures. Students will then design their own experiments to investigate more complex problems in sensory psychology.	
	(Offered 1967-68, Winter quarter)
<b>19.822 Advanced Experimental Psychology II</b> Prep. 19.821, Advanced Experimental Psychology I	
Experiments in animal and human learning and in perception will be conducted.	(Offered 1967-68, Spring quarter)
<b>19.823 Conditioning</b>	
An analysis of classical and instrumental conditioning procedures. Various theoretical approaches will be discussed, and a major emphasis will be placed on relevant experimental findings.	
	(Offered 1967-68, Fall quarter)
<b>19.824 Human Learning</b>	Prep. 19.823, Conditioning or permission of the instructor
Such areas of human learning as transfer of training, verbal learning, memory, measurement of meaning, operant conditioning of verbal behavior, and learning of grammatical structure will be reviewed.	
	(Offered 1967-68, Winter quarter)
<b>19.825 Cognitive Processes</b>	Prep. 19.824, Human Learning or permission of the instructor
Cognitive areas such as the nature of thought, problem solving, concept attainment, the relation between language and thought, and cognitive growth and development. Emphasis will be placed upon current research and theory.	
	(Offered 1967-68, Spring quarter)
<b>19.826 Perceptual Processes</b>	
Theoretical approaches to perception will be surveyed in relation to current experimental findings. Specific topics will include perceptual organization, constancy, the perception of depth and color, figural after-effects, and the influence of motivational and attitudinal determinants upon perception.	
	(Offered 1967-68, Fall quarter)
<b>19.827 Visual Processes</b>	Prep. Admission to doctoral candidacy or permission by instructor
The seminar will cover classical and modern problems in vision. Students will base their seminar reports on topics such as visual sensitivity, activity, color perception, photochemistry, neurophysiology, etc. Reports will be based upon the relevant literature and upon research undertaken by the student. Limited to 15 people.	
Credits: 3 quarter hours.	(Offered 1967-68)

<b>19.828 Psychoacoustics</b>	Prep. Admission to doctoral candidacy or permission by instructor
Such topics as theories of pitch perception, models of loudness, critical bands, interaural integration and detection theory will be discussed and serve as the basis for reports by students. Opportunities for seminar reports based partly upon experimental work will be available. Limited to 15 people.	
Credits: 3 quarter hours.	(Offered 1967-68, Spring quarter)
<b>19.830 Learning I</b>	Prep. Admission to doctoral candidacy or permission by instructor
Investigation of contemporary issues in classical and instrumental conditioning. Emphasis will be placed upon a critical analysis of specialized research areas such as secondary reinforcement, discrimination, and generalization.	
Credits: 3 quarter hours.	(Offered 1967-68)
<b>19.831 Learning II</b>	Prep. Admission to doctoral candidacy or permission by instructor
Analysis of current research trends and issues in human learning. Areas of concern will include serial learning, paired associate learning, and verbal behavior.	
Credits: 3 quarter hours.	(Offered 1967-68, Winter quarter)
<b>19.832 Cognition</b>	Prep. Admission to doctoral candidacy
Recent research in the areas of problem solving and concept learning will be reviewed. Students will be expected to consult current journal literature for class reports. Limited to 15.	
Credits: 3 quarter hours.	(Offered 1967-68)
<b>19.833 Perception</b>	Prep. Admission to doctoral candidacy or permission by instructor
A detailed consideration of research in such areas as form, space and pattern perception, recognition, and the effects of set and motivation on perception. Physiological concomitants of perceptual phenomena will be considered.	
Credits: 3 quarter hours.	(Offered 1967-68)
<b>19.840 Physiological Psychology I</b>	
This two-quarter course will consider theoretical issues and current research on the neurophysiological bases of motivation, emotion, learning, memory, perception, attention, sleep, and pain.	
	(Offered 1967-68, Winter quarter)
<b>19.841 Physiological Psychology II</b>	Prep. 19.840, Physiological Psychology I
Continuation of 19.840 Physiological Psychology I.	
	(Offered 1967-68, Spring quarter)

<b>19.842</b>	<b>Physiological Methods</b>	Prep. Admission to doctoral candidacy or permission by instructor
An introduction to basic methods of physiological psychology, including animal surgery, electrical stimulation of the brain, electrophysiological recording, and histological techniques. Students will gain experience in these method by carrying out a limited research project during the semester. Seminar limited to 10.		
Credits: 3 quarter hours.		(Offered 1967-68)
<b>19.843</b>	<b>Neurophysiological Basis of Behavior</b>	Prep. Admission to doctoral candidacy or permission by instructor
Selected topics in the neurophysiology of perception, emotion, motivation, learning and memory will be pursued in depth, with emphasis upon a critical evaluation of recent literature. Limited to 15.		
Credits: 3 quarter hours.		(Offered 1967-68, Fall quarter)
<b>19.846</b>	<b>Comparative Psychology</b>	Prep. Admission to doctoral candidacy or permission by instructor
Animal behavior will be analyzed from the viewpoints of genetics, evolution, and ethnology.		
Credits: 3 quarter hours.		(Offered 1967-68, Winter quarter)
<b>19.850</b>	<b>History of Psychology</b>	
The evolution of contemporary theoretical concepts and issues from their historical origins in philosophy and the physical, social, and medical sciences will be considered. Major emphasis will be on the emergence of the scientific method in psychology.		
		(Offered 1967-68, Winter quarter)
<b>19.851</b>	<b>Current Issues</b>	Prep. 19.803, Statistics III, 19.823, Conditioning, 19.824, Human Learning (may be taken concurrently)
Consideration in detail of a number of theoretical problems and issues of concern in the current psychological literature. Topics of broad interest from all major areas of psychology will be treated.		
		(Offered 1967-68, Spring quarter)
<b>19.852</b>	<b>Philosophy of Science</b>	Prep. Admission to doctoral candidacy or permission by instructor
The development of scientific thought from Copernicus to Einstein, emphasizing the positivistic philosophy of physics as appropriate for the behavioral sciences. Principal topic areas include: axiomatics, Poincare's relative consistency proof, the logic of quanta and Heisenberg's indeterminacy principle, space-time interdependence, the structure of matter, the logic of measurement and probability.		
Credits: 3 quarter hours.		(Offered 1967-68, Fall quarter)

**19.901 Dynamic Theories of Personality: Classical Psychoanalytic Orientations**

An extensive survey and critical evaluation of the Freudian conceptualization of the normal personality and its development. Readings from original sources will supplement classroom work.

(Offered 1966-67, Winter quarter)

**19.902 Dynamic Theories of Personality: Modifications in Psychoanalytic Theory**

Prep. 19.901, Dynamic Theories of Personality:  
Classical Psychoanalytic Orientations

A survey of selected theorists representing significant developments in the psychoanalytic view of the normal personality and its development, e.g., Fromm, Jung, Hartmann, Erikson. Readings from original sources will supplement classroom work. (Offered 1967-68, Spring quarter)

**19.903 Motivation**

Prep. 19.824, Human Learning  
19.841, Physiological Psychology II

Dealing with both animal and human motivation, but centering mainly upon the latter, the course will consider the principal theoretical orientations as well as relevant experimental evidence and methodological problems.

(Offered 1967-68, Fall quarter)

**19.904 Motivation and Emotion**

Prep. Admission to  
doctoral candidacy or permission by instructor

An attempt to achieve an integrated understanding of motivation, drawing upon the concepts and experimental findings of learning theory, personality, physiological psychology, perception, and social psychology. The usefulness of the concept of emotion, and its place in the description and theory of motivation will be examined.

Credits: 3 quarter hours.

(Offered 1967-68)

**19.905 Personality Theory and Research**

Prep. Admission to  
doctoral candidacy or permission by instructor

A critical examination of the fundamental concepts and assumptions of several major personality theories, based on a survey of recent research in personality. Characteristic problems in personality research will also be considered.

Credits: 3 quarter hours.

(Offered 1967-68)

**19.906 Research on Hypnosis**

Prep. Admission to  
doctoral candidacy or permission by instructor

Detailed consideration of problems of design, methodology, and control in hypnotic research. Current definitions, descriptions, and theories of hypnosis will be discussed and evaluated on the basis of a critical survey of the experimental literature in hypnosis.

Credits: 3 quarter hours.

(Offered 1967-68)



#### **19.920 Social Psychology**

Group phenomena and the influences of the group upon the thought and behavior of the individual. Such topics as social interaction, perception, opinions, attitudes, leadership, and social conflict will be considered. Basic theories as well as fundamental experimental evidence will be explored.

(Offered 1967-68, Fall quarter)

#### **19.921 Social Psychology — Advanced**

Prep. Admission to doctoral candidacy or permission by instructor

An examination of socialization in the broad sense. Consideration of the influences of differing environments upon the person's development, experience, and behavior with special reference to opinions and attitudes. The course will deal with alternative descriptions of social stimulus situations and the individual's relationship to them.

Credits: 3 quarter hours.

(Offered 1967-68, Spring quarter)

#### **19.990 Special Topics in Psychology**

Credits: To be arranged.

(Offered yearly)

#### **19.991 Thesis**

Experimental work for the master's degree requirement.

Credits: 6 quarter hours.

(Offered yearly)

#### **19.992 Research Problems**

Experimental or theoretical work for master's degree candidates.

Credits: 6 quarter hours.

(Offered yearly)

#### **19.995 Thesis**

Experimental and theoretical work for Ph.D. candidates.

Credits: 6 quarter hours.

(Offered yearly)

# *Sociology and Anthropology*

## THE MASTER'S DEGREE

### Admission

To be enrolled for graduate work in the Department of Sociology and Anthropology, applicants must have obtained a bachelor's degree from a recognized institution. The undergraduate program should include at least 15 semester hours of sociology or anthropology, but qualified applicants with less than this specified amount of course work will be considered on an individual basis. In addition, applicants should have taken an undergraduate course in statistics and one in theory. If such courses have not been taken, students must take basic courses in statistics and social theory in addition to the regular requirements. All applicants must have taken all three sections of the Graduate Record Examination, Verbal, Mathematics, and advanced. Other tests such as the Miller Analogy Test may be submitted in addition.

### Full-Time Program

Forty-two quarter hour credits of academic work are required. With the approval of the faculty adviser, a maximum of six quarter hours may be elected from graduate courses in other departments, and a maximum of eight quarter hours may be elected from advanced undergraduate courses. Course work must be approved in advance by the Chairman of the Department or the Director of the Graduate Program.

The department offers a graduate program that leads to a Master of Arts degree in Sociology, Social Anthropology, or Sociology with a specialization in Criminology. In addition, a student may pursue the following fields of concentration: research methods, comparative social change, and social structure.

A thesis is required for six quarter hours of credit. Arrangements for the thesis adviser must be approved by the Chairman of the Department or the Director of the Graduate Program.

Students who take a full-time program can generally complete their course requirements in one year and obtain their M.A. as soon after this time as their thesis is completed. Students have a choice of two programs to follow, sociology or social anthropology.

The following courses are required for a degree in sociology:

	Credits
20.801 Theory of Social Anthropology .....	3
20.805 Research Methods in Anthropology .....	3
21.805 Foundations of Social Theory .....	3
21.806 Contemporary Sociological Theories .....	3
21.810 Introduction to Research Methodology .....	3
21.811 Advanced Social Research Methods .....	3
21.813 Statistics .....	3
21.991 Thesis .....	<u>6</u>
	<u>27</u>
Electives .....	<u>15</u>
	<u>42</u>

The following courses are required for a degree in social anthropology:

	Credits
20.801 Theory of Social Anthropology .....	3
20.805 Research Methods in Anthropology .....	3
20.806 Field Work .....	3
20.810 Primitive Social Organization .....	3
20.822 Language and Culture .....	3
20.991 Thesis .....	<u>6</u>
21.806 Contemporary Sociological Theories .....	3
21.810 Introduction to Research Methodology .....	3
	<u>27</u>
Electives .....	<u>15</u>
	<u>42</u>

### Co-operative Plan

Under this plan, the student is employed full-time in work related to his academic program during alternate quarters of his graduate career. In his first year, the student would take a full course load in the Fall and Spring quarters while in the Winter quarter he would be employed full-time. In the second year, he would be employed in the Fall and Spring quarters while attending classes in the Winter quarter.

The graduate program will normally be taken in accordance with the following pattern:

FIRST YEAR			
Fall Quarter	Credits	Spring Quarter	Credits
21.805 Foundations of Social Theory ....	3	21.806 Contemporary Sociological Theories .....	3
20.805 Research Methods in Anthropology ...	3	21.810 Introduction to Theories .....	3
		Methodology .....	3

**SECOND YEAR**

Winter Quarter	Credits
20.801 Theory of Social Anthropology . . . . .	3
21.811 Advanced Social Research Methods . . . . .	3

The student is thus assisted in financing his education while obtaining experience in research or other activities related to his professional growth. A co-operative student would ordinarily complete his course requirements in a year and a half, and receive his M.A. degree upon completion of his thesis. He would be regarded as a full-time student for this entire period.

**Evening Part-Time Program**

The admission requirements are the same as for the full-time program, but students may progress according to their abilities and time available. The required courses are the same as those for the full-time program. Two out of the following graduate courses must be taken during the first year of study:

	Credits
21.805 Foundations of Social Theory . . . . .	3
21.810 Introduction to Research Methodology . . . . .	3
20.801 Theory of Social Anthropology . . . . .	3
20.805 Research Methods in Anthropology . . . . .	3

**Language Requirement**

In accordance with the general Graduate Division regulations, proficiency must be demonstrated in a foreign language, to be specified by the Department.

**Comprehensive Examination**

This examination will be held in accordance with the general Graduate Division regulations.

**DESCRIPTION OF COURSES**

All courses carry three quarter hour credits unless otherwise specified.

**SOCIOLOGY****21.805 Foundations of Social Theory**

Major concepts of sociological theory: social control and deviance, power and authority, cohesion and conflict, class and bureaucracy, alienation and anomie, status and role, the generalized other and the self. The classic theorists will be read, and student papers will be presented at this seminar, which shall be limited to 15 students. (Offered yearly)

**21.806 Contemporary Sociological Theories** Prep. 21.805 or consent of instructor  
 Focus will be on the relations between the individual and society, and on social structure and social functions. Development of functionalism in anthropology and sociology: Durkheim, Malinowski, Radcliffe-Brown. Man and Society from the viewpoints of Mead, Thomas, and Mannheim. Student papers will be presented at this seminar, which shall be limited to 15 students. (Offered yearly)

**21.807 Sociological Analysis** Prep. 21.806 and 21.811  
 Principles of structural-functional analysis. The bearing of theory on research and the bearing of research on theory. Tabulation and cross-tabulation as a conceptual device for typology and index construction. (Offered yearly)

**21.810 Introduction to Research Methodology** 2 Cl.; 2 Lab.  
 Methodology of empirical social research including survey techniques, interviewing, questionnaire construction, and the logic of research design. Students will take part in a survey. (Offered yearly)

**21.811 Advanced Social Research Methods** Prep. 21.810 and 21.813, 2 Cl.; 2 Lab.  
 Selection of appropriate research designs, the interpretation of findings, and the relationship of research to theory. Systematic analysis will be made of selected research studies. (Offered yearly)

**21.813 Social Statistics** 2 Cl.; 2 Lab.  
 An introduction to the statistics of measurement, including probability distributions, confidence intervals, linear regression and correlation, and chi-square. (Offered yearly)

**21.814 Advanced Social Statistics** Prereq. 21.813, 2 Cl.; 2 Lab.  
 Applications of the statistics of sampling, analysis of variance and covariance, multiple and partial correlation, and non-parametric methods. (Offered yearly)

**21.815 Analysis of Multivariate Data** Prep. 21.811 and 21.813  
 Introduction to computer programming and use of data processing equipment; computer methods of statistical analysis. (Offered 1967-68, Spring quarter)

**21.817 American Society**  
 Study of the development of and the changes in the institutional structure of American society in comparison with certain other social systems. (Offered 1968-69, Summer quarter)

**21.820 Sociology of Deviant Behavior**  
 Applications of sociological concepts and principles to some problems of social disorganization in industrial societies. Analysis of such problems as suicide, prostitution, physical handicaps, unemployment, alcoholism, sexual deviance, and gambling. (Offered yearly)

**21.825 Sociology of Crime**

Analysis of the crime factors, criminal typology, occasional and professional criminals, habitual criminality, abnormality and crime, white collar criminals, the criminal crowd, social implications. (Offered yearly)

**21.827 Sociology of Delinquency**

Social and psychological factors of delinquency and their implications for prevention, rehabilitation, and treatment. (Offered yearly)

**21.830 Problems in Penology**

Prep. 21.825 or 21.827

Police, court, corrections. The penal system and its treatment methods. Prison. Capital punishment. Probation and conditional sentencing. The inmate society. Parole. After-care. Social consequence of crime.

(Offered yearly)

**21.835 Theories in Criminology**

Prep. 21.825 or 21.827

Theories and philosophies underlying various correctional systems. Schools of thought in criminology and penology. Theoretical approaches to the crime and delinquency problem from the beginnings of criminology to current thinking.

(Offered yearly)

**21.837 Sociology of Law**

Fundamentals of law. The concept of social control. Order and Law. Consensus and conflict. Analysis of the normative-formative influences of law. Mores and morals. The concept of justice. The administration of justice. Analysis of some legal institutions.

(Offered 1968-69, Winter quarter)

**21.840 Sociology of Medicine**

Social aspects of illness and medicine, historically and cross-culturally. Illness and the medical profession in modern society, and their structural settings: the community, the hospital, the medical school. Research studies in the field will be examined critically and problems for future research will be specified.

(Offered 1967-68, Spring quarter)

**21.847 Formal Organizations**

Analysis of the goals, functions, and consequences for the individual of modern organizations. Aspects of bureaucratization will be examined within business firms, public institutions, and private associations.

(Offered 1968-69, Fall quarter)

**21.850 Work and Society**

The literature of various fields will be reviewed on the subject of work and society. The contributions of economic anthropology, industrial sociology, and the psychology of occupations and careers will be discussed. Current research will be examined intensively.

(Offered 1967-68, Fall quarter)

**21.855 Political Sociology**

Sociological analysis of power relations and power systems with special attention to the bases of political power, processes of change in power, and the part played by violence and revolutionary movements.

(Offered 1967-68, Fall quarter)

**21.860 Intergroup Relations**

The relationship between various racial, nationality, cultural, and religious groups with emphasis on historical development. Particular attention will be paid to American society with its specific problems of adjustment and assimilation.

(Offered yearly)

**21.870 The Family**

A comparative and historical treatment. Contemporary problems are discussed from the point of view of the functions, forms, and processes of this institution in relation to social structure.

(Offered yearly)

**21.880 Community Analysis**

Ecological theories of man's relation to his physical environment. Development of the concept, and discussion of methods for community study. Comparison between rural communities and urban neighborhoods. Discussion and evaluation of community action programs.

(Offered 1967-68, Winter quarter)

**21.885 Urban Sociology**

Theories of the development of urban life. Comparisons between pre-industrial and industrializing urban areas. Methods for the study of urban social structure and change. Evaluation of contemporary metropolitan action programs.

(Offered 1967-68, Spring quarter)

**21.890 Middle East Area Study**

Socio-cultural analysis of the Middle East. Ecological, structural, institutional, and normative factors in nomadic, rural, and urban life. Inter- and intra-region comparative analysis.

(Offered 1968-69, Winter quarter)

**21.895 Latin American Institutions**

Study and analysis of the institutions of Latin America with particular attention to such countries as Mexico, Peru, Brazil, and Argentina. The area is approached from both an historical and a contemporary point of view.

(Offered yearly)

**21.900 Individual and Society**

Socialization and adjustment from the standpoint of Horney, Erikson, Sullivan, Cooley, Thomas, Mead, and Riesman. A consideration of some of the principal stress-engendering features of complex societies.

(Offered 1967-68, Winter quarter)

**21.910 The Sociology of Science**

The functions of science and technology in occupational and structural social change. The works of Price, Sarton, Cohen, Kuhn, Ogburn, and Merton will be consulted.

(Offered 1967-68, Spring quarter)

**21.920 Social Stratification**

Theories of inequality between groups in historical perspective, from classical to modern industrial times. Discussion and evaluation of sociological research in social stratification in regard to different social and cultural groups.

(Offered 1968-69, Fall quarter)

**21.930 Social Change**

Analysis of the changing patterns in social, economic, and political institutions. Modern social trends are discussed with particular emphasis on Latin America.

(Offered 1968-69, Spring quarter)

**21.980 Contemporary Issues**

Contemporary issues in sociology. Supervised readings and written reports on special problems.

(Offered yearly)

**21.990 Seminar**

Discussion of selected topics in the field of sociology. Consent of Departmental Chairman is required.

Credits: To be arranged.

(Offered yearly)

**21.991 Thesis**

Thesis supervision by members of the Sociology and Anthropology Department.

Credits: 6 quarter hours.

(Offered yearly)

## **SOCIAL ANTHROPOLOGY**

**20.801 Theory of Social Anthropology**

History of major contemporary orientations in the field. Evolutionary approaches, culture area and historical analysis, functionalism, role structure, comparative methods, social relations approaches, and the theory of cognitive structure.

(Offered yearly)

**20.805 Research Methods in Anthropology**

Data collection through participant-observation, use of personal documents, and various analytic methods in ethnology.

(Offered yearly)

**20.806 Field Work**

Prereq. 20.805 or permission of the instructor

Data pertaining to problems developed in 20.805 will be collected from the general Boston area, and attempts will be made to develop these pilot projects into carefully designed projects.

(Offered yearly)

**20.810 Primitive Social Organization**

Institutions of primitive societies; comparative and functional analysis of a limited number of societies. The dynamics of continuity and change of culture and social organization.

(Offered yearly)

**20.820 Peasant Society and Culture**

Institutions of peasant society. The structure of traditional civilizations and the interrelations between urban and local communities; comparative and functional analysis of the peasant community and the dynamics of change from peasant to post-peasant and industrialized societies.

(Offered 1968-69, Spring quarter)

**20.825 Language and Culture**

Communication in non-human societies. Theories of the evolution of language. Language and thought. Structural linguistics. Recent developments in Linguistic Theory.

(Offered yearly)

**20.830 Culture and Personality**

Examination of current theory and method in the study of the interplay between personality and culture. Contributions by various disciplines are discussed.

(Offered yearly)

**20.840 Comparative Community Studies**

Intensive review of community studies in developed and developing areas. Examination of methods for comparative analysis.

(Offered 1968-69, Winter quarter)

**20.850 Comparative Religion**

Nature and institutionalization of primitive, ancient, and contemporary religions. Exploration of religious concepts and religious movements in relation to social and political organization.

(Offered 1967-68, Winter quarter)

**20.860 Comparative Economic Systems**

Types of economic systems in simple societies: reciprocal, redistributive, market exchange. Economic relations as part of social relations: Land tenure systems, credit systems, savings mechanisms. The transition from subsistence to cash economies.

(Offered 1967-68, Spring quarter)

**20.870 Anthropology of History**

Origins and growth of the institutions of civilization; specialization, social stratification in the dynamics of traditional civilizations. Also, some special topics of contact and change. (Offered 1968-69, Spring quarter)

**20.906 Models of Social Structure**

Strategy of model building. Models of kinship structure and of more complex systems. Particular attention will be paid to the work of Levi-Strauss, Leach and other modern "structuralists."

(Offered 1968-69, Fall quarter)

**20.980 Contemporary Issues**

Contemporary issues in the field of anthropology. Supervised readings and written reports on special problems. (Offered yearly)

**20.990 Seminar**

Discussion of selected topics in the field of anthropology. Consent of departmental chairman required.

Credits: To be arranged. (Offered yearly)

**20.991 Thesis**

Thesis supervision by members of the Sociology and Anthropology Department.

Credits: 6 quarter hours. (Offered yearly)





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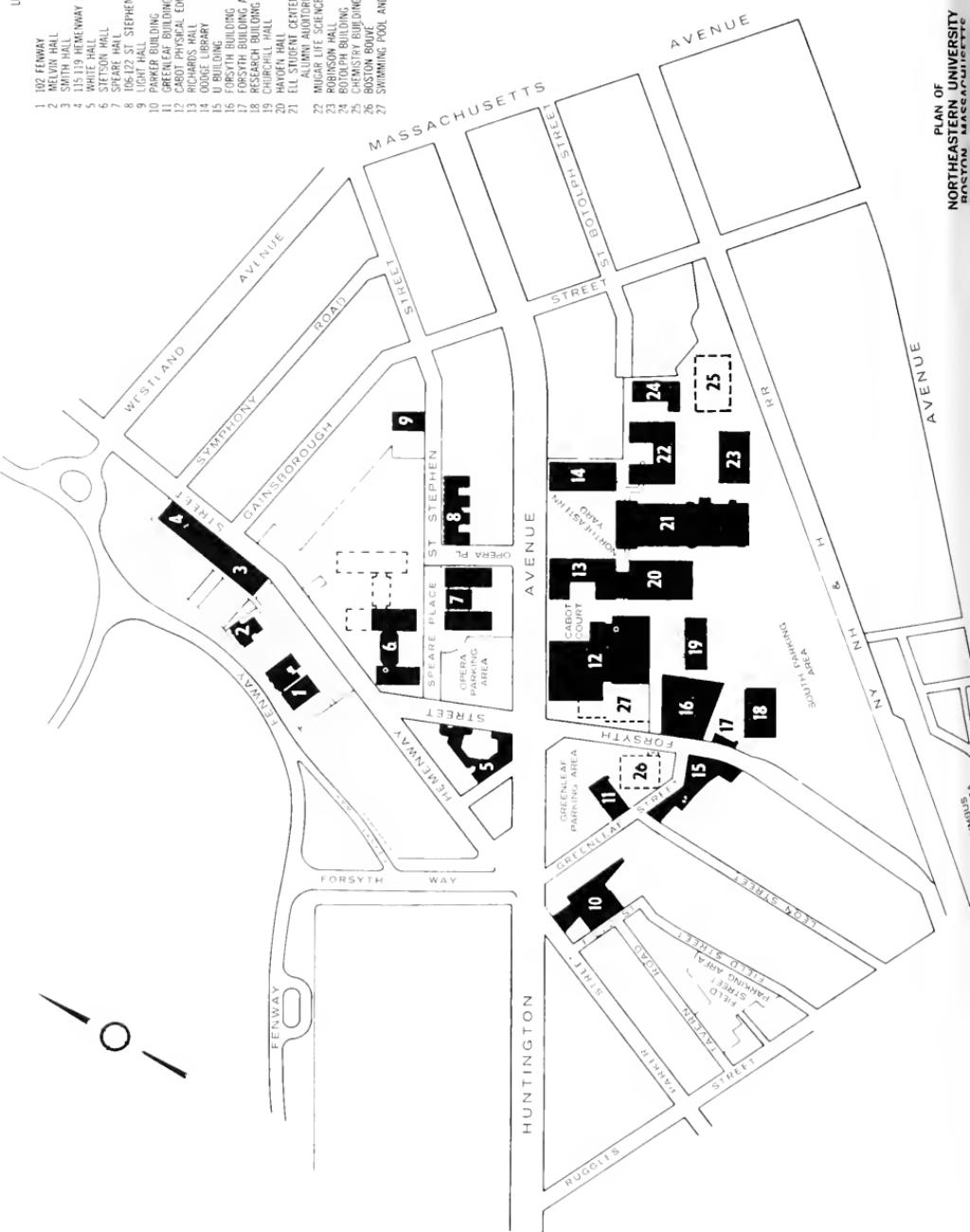
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- 4 115 1/2 WENDELL STREET
- 5 WHITE HALL
- 6 STEPHON HALL
- 7 SPARKS HALL
- 8 106 1/2 ST. STEPHEN STREET
- 9 LIGHT HALL
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- 11 GREENEAF BUILDING
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- 15 U BUILDING
- 16 FORSYTH BUILDING
- 17 FORSYTH BUILDING ANNEX
- 18 RESEARCH BUILDING
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- 27 SWIMMING POOL AND HANDBALL FACILITIES



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Robert A. Feer	*Kenneth G. Ryder
James M. Feldman	Eugene J. Saletan
*Arthur E. Fitzgerald	*Ronald E. Scott
Walter L. Fogg	G. Donald Shelby
Norbert L. Fullington	Ernest L. Spencer
Charles M. Goolsby	Robert D. Stuart
Charles F. Haley	*Loring M. Thompson
Lyman A. Keith	Ralph A. Troupe
George Khiralla	*Arthur A. Vernon
William F. King	Harold A. Walker
*Wilfred S. Lake	Karl H. Weiss
Frank F. Lee	Henry O. Werntz
*Minnie L. Lynn	Edward R. Willett
*Thomas E. McMahon	Alvin J. Yorra

## PRESIDING OFFICER

Asa S. Knowles  
or  
Arthur E. Fitzgerald

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\*Appointed by the President

## THE UNIVERSITY CABINET

Kenneth G. Ryder, Chairman

Gurth I. Abercrombie	Wilfred S. Lake
Dean S. Ammer	George M. Lane
Sidney F. Austin	George B. Le Beau
John S. Bailey	Donald W. Lovejoy
Charles O. Baird, Jr.	Minnie L. Lynn
Kenneth W. Ballou	Gilbert G. MacDonald
Lincoln C. Bateson	Donald H. MacKenzie
Richard W. Bishop	Alan A. Mackey
Jack R. Bohlen	Richard D. MacPherson
Alvah K. Borman	George A. Mallion
Philip C. Boyd	Reuben J. Margolin
Bernard J. Brent	Frank E. Marsh, Jr.
Russell E. Brillhart	John P. McCarron
Richard I. Carter	Daniel J. McCarthy
Thomas J. Cavanagh	Thomas E. McMahon
Ronald W. Clifford	Edmund J. McTernan
Geoffrey Crofts	Roland H. Moody
Otis F. Cushman	Timothy F. Moran
Edmund L. Deltano	Rudolph M. Morris
Ray C. Dethy	Edmund J. Mullen
Charles M. Devlin	Rudolf O. Oberg
Albert M. Donley, Jr.	Frederic Palmlad
William T. Edgett	Edward S. Parsons
Edith E. Emery	Philip W. Pendleton
Martin W. Essigmann	Eugene M. Repucci, Jr.
Albert E. Everett	Daniel J. Roberts, Jr.
Arthur E. Fitzgerald	William E. Roberts
Walter H. Floyd	Edward W. Robinson
Herbert W. Gallagher	Gustav S. Rook
Gilbert C. Garland	Norman Rosenblatt
James E. Gilbert	Ronald E. Scott
Joseph M. Golemme	Robert Sheehan
Hall H. Graves	Richard E. Sprague
Carlo E. Gubellini	Descomb T. Stewart
E. Forest Hallet	Donald J. Taylor
George W. Hankinson	Loring M. Thompson
Charles W. Havice	Royal K. Toebe
James S. Hekimian	Frank E. Truesdale
Nelson R. Hill	Donald K. Tucker
Henry R. Hilliard, Jr.	Robert E. Turner
Louise W. Hord	Arthur A. Vernon
Francis L. Hurwitz	Charlotte E. Voss
Robert J. Kates	Louis Vrettos
Israel Katz	Janice Walker
LeRoy C. Keagle	William Wallace
Walter E. Kearney	John B. Whitla
Christopher F. Kennedy	Roy L. Wooldridge
Charles E. Kitchin	

### EX OFFICIO

Asa S. Knowles

William C. White

# **ADMINISTRATIVE ORGANIZATION**

## **OFFICERS OF THE UNIVERSITY**

Asa S. Knowles, A.B., A.M., LL.D., Litt.D., Sc.D.	President
Carl S. Ell, A.B., M.S., Sc.D., L.H.D., LL.D., D.S.Ed.	President Emeritus
William C. White, B.S., Ed.M., Eng.D.	Executive Vice President
Lincoln C. Bateson, B.B.A., M.B.A.	Vice President and Director of Finance

## **OFFICERS OF GENERAL ADMINISTRATION**

John S. Bailey, B.S., M.B.A.	Assistant to the President
Kenneth W. Ballou, A.B., Ed.M.	Dean of University Relations
Jack R. Bohlen, B.B.A.	Director of Development
Arthur E. Fitzgerald, E.E., S.M., Sc.D.	Vice President for Academic Affairs and Dean of Faculty
Gilbert G. MacDonald, B.I.E., Ed.M.	Dean of Students
Edward S. Parsons, B.S., Ed.M.	Business Manager
Kenneth G. Ryder, A.B., M.A.	Vice President and Dean of University Administration
Loring M. Thompson, B.S., M.S., M.A., Ph.D.	Dean of University Planning
Roy L. Wooldridge, B.S., Ed.M.	Vice President and Dean of Co-operative Education

## **OFFICERS OF GENERAL ACADEMIC ADMINISTRATION**

John S. Bailey, B.S., M.B.A.	Acting Dean of University College
Geoffrey Crofts, B.Comm., F.S.A.	Dean and Director of the Graduate School of Actuarial Science
Martin W. Essigmann, S.B., M.S.	Dean of Research
Albert E. Everett, B.S., M.B.A., D.C.S.	Dean of Continuing Education
Gilbert C. Garland, B.S., Ed.M., Ed.D.	Dean of Admissions
James E. Gilbert, B.S., M.A., Sc.D.	Director of the Office of Educational Resources
Charles W. Havice, A.B., M.A., S.T.B., Ph.D., D.D.	Dean of Chapel
James S. Hekimian, A.B., M.B.A., D.B.A.	Dean of Business Administration
LeRoy C. Keagle, B.S., Ph.D.	Dean of Pharmacy
Wilfred S. Lake, A.B., M.A., Ph.D.	Dean of Liberal Arts
Minnie L. Lynn, A.B., M.S., Ph.D.	Dean of Boston-Bouvé College
Frank E. Marsh, Jr., A.B., M.Ed., D.Ed.	Dean of Education
Roland H. Moody, A.B., B.L.S.	Director of the University Library
Rudolph M. Morris, B.S., Ed.M.	University Registrar
Gustav S. Rook, B.S., Ed.M.	Dean of Lincoln College
Ronald E. Scott, B.S., M.A., Sc.D.	Dean of Engineering
Robert Sheehan, A.B., M.A.	Acting Dean of Criminal Justice
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Charlotte E. Voss, B.S., M.S., Ed.D.	Dean of Nursing
Louis Vrettos, B.S., M.A., Ed.D.	Dean of Instruction and Director of the Suburban Campus

# *Aims and Scope of the University*

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston-Bouvé College (1964), and the College of Criminal Justice (1967). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

The following is a brief outline of the aims and scope of the University's programs.

## UNDERGRADUATE COLLEGES

### BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study—Physical Education, Recreation, and Physical Therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Co-operative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

### COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

### COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

### **COLLEGE OF ENGINEERING**

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

### **COLLEGE OF LIBERAL ARTS**

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Co-operative Plan.

### **LINCOLN COLLEGE**

Lincoln College offers part-time evening programs leading to associate and/or bachelor's degrees in Allied-Medical Technology, Civil Engineering Technology, Electrical Engineering Technology, Industrial Technology, Mechanical Engineering Technology, and Science Technology. Additional programs in industrial, science, and allied-medical technology, leading to the Bachelor of Science degree, are offered in collaboration with University College.

### **COLLEGE OF NURSING**

The College of Nursing offers two separate and distinct programs of study, both organized on the Co-operative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals—Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General—collaborate with Northeastern by providing suitable co-operative work opportunities during the upper-class years of these programs.

### **COLLEGE OF PHARMACY**

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

## **UNIVERSITY COLLEGE**

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement and Security, and Health-Related Programs, leading to the Associate in Science and Bachelor of Science degrees. Workshops and seminars are offered for degree credit.

University College does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students.

In collaboration with Lincoln College, University College offers programs in Allied-Medical Technology and Science Technology leading to the Bachelor of Science degree.

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

## **GRADUATE DIVISION**

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

### **ACTUARIAL SCIENCE**

Master of Science in Actuarial Science.

### **ARTS AND SCIENCES**

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, and Psychology.

### **BUSINESS ADMINISTRATION**

Master of Business Administration.

### **EDUCATION**

Master of Education.

### **ENGINEERING**

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and

master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

### **PHARMACEUTICAL SCIENCES**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

### **PROFESSIONAL ACCOUNTING**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

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Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

### **PROGRAMS FOR ADULT WOMEN**

These programs were developed to meet the needs of women with family or other obligations who wish to engage in part-time study during the day. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered. Enrollment is not restricted to women.

### **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working co-operatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## AFFILIATED PROGRAMS

### FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

### FOR MEDICAL TECHNOLOGISTS

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

### FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

## RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.

# *Buildings and Facilities*

Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South Stations. To reach the University from the North Station, board an MBTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

## HUNTINGTON AVENUE CAMPUS

The principal educational buildings of Northeastern University are located on Huntington Avenue on 16 acres of a 47-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 4.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to nine new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The new buildings are interconnected by means of tunnels.

In addition to classrooms and instructional offices, the principal buildings and facilities are:

**Botolph Building.** Civil Engineering Laboratories.

**Cabot Physical Education Center.** Facilities for physical education and athletics; gymnasium; cage; rifle range.

**Churchill Hall.** Graduate Division; Physics Laboratories; faculty and staff cafeteria.

**Dodge Library.** Library; Center for Programmed Instruction; Engineering drawing rooms; Language Laboratory.

**EII Student Center.** Student activities; chapel; auditorium; student cafeteria; bookstore; student lounges and meeting rooms.

**102 The Fenway.** Center for Reading Improvement; Stearns Center for Research; gymnasium.

**Forsyth Building.** Laboratories for Industrial Engineering, Mechanical Engineering, and Allied Medical Sciences; planetarium; University Infirmary and Health Services.

**Greenleaf Building.** ROTC headquarters; research facilities.

**Hayden Hall.** Lincoln College; University College; Colleges of Business Administration, Education, Engineering, and Liberal Arts; Electrical Engineering Laboratories.

**Mugar Life Sciences Building.** College of Pharmacy; laboratories for Biology, Chemical Engineering, and Psychology.

**Research Building.** Research facilities for Electrical Engineering and Physics.

**Richards Hall.** Administrative offices; laboratories for Chemistry and Mechanical Engineering; bookstore.

**Robinson Hall.** Boston-Bouvé College; College of Nursing; laboratories for Biology and Physical Therapy; radio and television facilities.

**United Realty Building.** Research facilities for Mechanical Engineering, Biology, Psychology, and Chemistry; Institute for Rehabilitation.

### SUBURBAN CAMPUS AT BURLINGTON

In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-arts programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

### HENDERSON HOUSE

At Henderson House in Weston, Massachusetts, Northeastern University operates one of the nation's finest off-campus centers for continuing education. Adults enroll in short-term courses, seminars, and special institutes at this conference center, located 12 miles from the main campus on Huntington Avenue.

### WARREN CENTER

A 70-acre tract in Ashland, including a small lake, is being developed for use as a laboratory for instruction in physical education and recreation.



*Graduate Division*  
*Organization*

## **Graduate Schools and Degree Programs**

### **GRADUATE SCHOOL OF ACTUARIAL SCIENCE**

MASTER OF SCIENCE IN ACTUARIAL SCIENCE

### **GRADUATE SCHOOL OF ARTS AND SCIENCES**

MASTER OF ARTS DEGREES

in the fields of

ECONOMICS, ENGLISH, HISTORY, POLITICAL SCIENCE,  
PSYCHOLOGY, and SOCIOLOGY-ANTHROPOLOGY

MASTER OF SCIENCE DEGREES

in the fields of

BIOLOGY, CHEMISTRY, HEALTH SCIENCES,  
MATHEMATICS, and PHYSICS

DOCTOR OF PHILOSOPHY DEGREES

in the fields of

BIOLOGY, CHEMISTRY, MATHEMATICS, PHYSICS, AND PSYCHOLOGY

### **GRADUATE SCHOOL OF BUSINESS ADMINISTRATION**

MASTER OF BUSINESS ADMINISTRATION

### **GRADUATE SCHOOL OF EDUCATION**

MASTER OF EDUCATION

### **GRADUATE SCHOOL OF ENGINEERING**

MASTER OF SCIENCE DEGREES

in the fields of

CHEMICAL, CIVIL, ELECTRICAL, INDUSTRIAL,  
and MECHANICAL ENGINEERING, and  
ENGINEERING MANAGEMENT

DOCTOR OF PHILOSOPHY DEGREES

in the fields of

CHEMICAL, ELECTRICAL, and MECHANICAL ENGINEERING

### **GRADUATE SCHOOL OF PHARMACEUTICAL SCIENCES**

MASTER OF SCIENCE IN HOSPITAL PHARMACY

MASTER OF SCIENCE IN INDUSTRIAL PHARMACY

MASTER OF SCIENCE IN MEDICINAL CHEMISTRY

MASTER OF SCIENCE IN PHARMACOLOGY

### **GRADUATE SCHOOL OF PROFESSIONAL ACCOUNTING**

MASTER OF SCIENCE IN ACCOUNTING

## GRADUATE DIVISION

### GENERAL ADMINISTRATION

Arthur A Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Janice Walker, A.B.	Registrar of the Graduate Division
W. Dennis Stires, B.S.	Administrative Assistant in the Graduate Division
Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M.	Administrative Assistant in the Graduate Division

### DIRECTORS OF THE GRADUATE SCHOOLS

Bernard J. Brent, B.S., M.S., Ph.D.	Graduate School of Pharmaceutical Sciences
Geoffrey Crofts, B.Comm., F.S.A.	Graduate School of Actuarial Science
Ray C. Dethy, B.S., M.A., Ph.D.	Graduate School of Education
Joseph M. Golemme, B.S., M.A.	Graduate School of Professional Accounting
George W. Hankinson, A.B., S.B., M.S.	Graduate School of Engineering
Daniel J. McCarthy, A.B., M.B.A., D.B.A.	Graduate School of Business Administration
Arthur A. Vernon, B.S., M.S., Ph.D.	Graduate School of Arts and Sciences

### UNIVERSITY GRADUATE COMMITTEE

**1966-67**

The responsibility of the committee is the determination of broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the committee.

#### Administrative Members

Arthur A. Vernon, Chairman	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, Secretary	Registrar of the Graduate Division
Bernard J. Brent	Professor of Medicinal Chemistry and Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts	Dean of the Graduate School of Actuarial Science
Ray C. Dethy	Assistant Dean of Education and Director of the Graduate School of Education
Arthur E. Fitzgerald	Dean of the Faculty
Joseph M. Golemme	Director of the Graduate School of Professional Accounting

George W. Hankinson	Assistant Dean of Engineering and Director of the Graduate School of Engineering
James S. Hekimian	Dean of Business Administration
LeRoy C. Keagle	Dean of Pharmacy
Wilfred S. Lake	Dean of Liberal Arts
Frank E. Marsh, Jr.	Dean of Education
Daniel J. McCarthy	Associate Dean of Business Administration and Director of the Graduate School of Business Administration
Kenneth G. Ryder	Dean of Administration
Ronald E. Scott	Dean of Engineering

**Elected Faculty Members****Terms Expire September, 1967**

Anker V. Andersen	Associate Professor of Accounting
David R. Cook	Associate Professor of Education
Robert J. Ferullo	Associate Professor of Special Education
Bernard M. Goodwin	Associate Professor of Chemical Engineering
John F. Reinhard	Professor of Pharmacology and Chairman of the Department
Nathan W. Riser	Professor of Biology and Director of the Marine Science Institute
Anghel N. Rugina	Professor of Economics and Finance
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
Albert H. Soloway	Associate Professor of Medicinal Chemistry
Ernest L. Spencer	Professor of Civil Engineering and Chairman of the Department

**Terms Expire September, 1968**

Wendell R. Brown	Associate Professor of Social Science Education
John F. Dunn	Professor of Mechanical Engineering
George M. Krause	Professor of Pharmacy
Robert W. Mullins	Associate Professor of Management
Robert J. Minichiello	Associate Professor of Marketing
Harold R. Raemer	Professor of Electrical Engineering and Chairman of the Department
Raymond H. Robinson	Professor of History and Chairman of the Department
George B. Rochfort, Jr.	Associate Professor of Education
Elliot Spector	Professor of Pharmacology
A. Bertrand Warren	Professor of Psychology and Chairman of the Department



# *General Graduate Division Regulations*

## **REGISTRATION**

Students must register in the Graduate Division Office at the times specified by the Graduate School calendar.

## **PROGRAM CLASSIFICATIONS**

Students who have registered for a degree program in the Graduate Division are given a program classification in one of the curricula listed in the catalog. Students who are not pursuing a specific degree program are entered upon the Graduate Division records as Special Students.

## **RESIDENCE**

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

## **PROGRAMS OF STUDY**

At the time of his first registration, each full-time student must develop, with the assistance of his faculty advisor, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty advisor.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school concerned.

### GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A. Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B. Satisfactory

This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.

C. Fair

This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.

F. Failure

This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

- I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.
- S. Satisfactory, without quality designation. This designation is used for thesis and seminar work.
- W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within four weeks after the quarter ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within one week following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

### WITHDRAWALS

Students who wish to withdraw from a course after the start of the quarter must file an official withdrawal form in the Graduate Division Office. Any student who is absent for three class periods in succession without excuse will be dropped from the class.

The University provides all instruction and accommodations on an academic quarter basis; therefore, no refunds are granted except in cases where students are compelled to withdraw because of personal illness or other reasons beyond their control. In no case are refunds made after a student has attended the fifth session of a class. Questions regarding refunds should be discussed with the Bursar's Office.

### **CLASS HOURS AND CREDITS**

All credits are entered as quarter hours. A quarter hour is defined as the equivalent of one hour in class and two hours of outside preparation for twelve weeks. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the sessions.

### **INTERVIEW AND REGISTRATION DATES, OFFICE HOURS, AND CLASS SCHEDULES**

For dates of the interview and registration periods and office hours, consult the calendar pages. Circulars listing the times at which courses are given are issued at the beginning of the academic year. Copies of these circulars may be obtained from the office of the Graduate Division, Northeastern University, Boston, Massachusetts 02115, or by calling 262-1100.

## **THE MASTER'S DEGREE**

### **ADMISSION**

Specific requirements for each department will be found in the appropriate paragraph under each departmental heading. The necessary material for admission for full-time graduate study must be filed by March 15, unless other filing dates are indicated by the respective graduate schools. Applications for all fields except for those in the Graduate Schools of Actuarial Science, Pharmaceutical Sciences, and Professional Accounting should be made directly to the Graduate Division Office.

For admission to any part-time program, a personal interview with the director of the appropriate graduate school or the head of a department is required. Transcripts of the applicant's prior college training must be presented at that time. If this is not possible, such material must be filed within six weeks after registration or the student will be asked to withdraw.

### **ACADEMIC CLASSIFICATIONS**

After review of an applicant's transcript of undergraduate work, those students who are admitted are given an academic classification as regular or provisional. Those who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular. Those who have an undergraduate record which is not acceptable for regular classification are classified as provisional. Provisional students must obtain a B average in the first 16 quarter hours of credit work for which they register in order to continue in the Graduate Division. Students whose records are not satisfactory may be dropped prior to the completion of this amount of work. When provisional students obtain a B average in the first 16 quarter hours of credit work, they will be classified as regular students. The Graduate Division requirements apply to both classified and special students.

### TRANSFER CREDITS

After a student has been accepted for graduate study toward the master's degree he may submit a request for transfer credit. A maximum of 12 quarter hours of graduate credit may be accepted toward a master's degree if such work is approved by the director of the graduate school concerned or the Departmental Graduate Study Committee. Transfer credit will be considered only if the work is consonant with the objectives of the graduate program and if the grades in the courses are A or B. No grades on transfer credits may be used for purpose of obtaining the academic average necessary for completion of the degree requirements.

### TIME LIMITATIONS

Course credits earned in the program of graduate study are valid for a maximum period of eight years. This time limitation is likewise applicable to any accepted transfer credits.





# *Tuition and Fees*

## **TUITION**

### **CO-OPERATIVE PROGRAMS**

Graduate School of Actuarial Science . . . . .	\$425 per quarter
Graduate School of Arts and Sciences . . . . .	\$400 per quarter
Graduate School of Engineering . . . . .	\$525 per quarter
Graduate School of Pharmaceutical Sciences .	\$525 per quarter
Graduate School of Professional Accounting .	\$500 per quarter

### **FULL-TIME DOCTORAL PROGRAMS**

Graduate School of Arts and Sciences . . . . .	\$500 per quarter
Graduate School of Engineering . . . . .	\$525 per quarter

### **OTHER GRADUATE PROGRAMS**

Graduate School of Arts and Sciences	
Courses on Huntington Avenue	
Campus . . . . .	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit
Graduate School of Business Administration	
Courses on Huntington Avenue	
Campus . . . . .	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit
Graduate School of Education	
Courses on Huntington Avenue	
Campus . . . . .	\$25 per quarter hour credit
Courses on Burlington Campus	\$25 per quarter hour credit
Guidance Practicum . . . . .	\$100
Student Teaching . . . . .	\$200
Graduate School of Engineering	
Courses on Huntington Avenue	
Campus . . . . .	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit

**FEES**

**REGISTRATION FEE** ..... \$10.00

Payable at time of first registration in all graduate schools except for non-degree students in the Graduate School of Education.

**LATE PAYMENT FEE** ..... \$ 5.00

For failure to pay tuition on due date.

**MAKE-UP FEE** ..... \$ 5.00

**MEDICAL INSURANCE FEE** ..... \$18.00

For full-time students.

**STUDENT CENTER CHARGES**

Graduate School of Actuarial Science

Co-operative Students ... \$10.00 per ten-week term of registration

Graduate School of Arts and Sciences

Co-operative Students ... \$12.50 per quarter of registration

Other Full-Time Students . \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Business Administration

Full-Time Students ..... \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Education

Full-Time Students ..... \$12.50 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Engineering

Co-operative Students ... \$12.50 per quarter of registration

Other Full-Time Students . \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Graduate Co-operative

Teaching Assistants ... \$ 6.25 per quarter of registration

Graduate Co-operative

Research Assistants .. \$ 6.25 per quarter of registration

Part-Time Students Registered on the Huntington Avenue Campus .....	\$ 0.75 per quarter of registration
Graduate School of Pharmaceutical Sciences Co-operative Students ...	\$12.50 per quarter of registration
Graduate School of Professional Accounting Co-operative Students ...	\$12.50 per quarter of registration
<b>GRADUATION FEE</b> .....	<b>\$25.00</b>
Payable by all students at time of award of degree.	

### PAYMENTS

Tuition statements will be mailed to the students by the Student Accounts Office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

## FINANCIAL AID

Northeastern University has available fellowships and assistantships for students who are engaged in graduate work. The Graduate Division will send candidates the proper application blanks upon request.

### TEACHING ASSISTANTSHIPS

Teaching assistantships are available in most of the departments giving graduate work. Holders of such assistantships carry a half-time academic load and devote half time to academic assistance in the departments. The assistantship grant includes a stipend and remission of tuition.

### TUITION FELLOWSHIPS

Some departments have available tuition fellowships which cover six to nine quarter hours of graduate work per quarter. In return, students will be required to assist in the academic work of the department. These fellowships are normally given to students who are in the first year of graduate work.

### RESEARCH FELLOWSHIPS

Research fellowships are available in some departments giving graduate work. Holders of such fellowships carry a half-time academic load and devote half time to academic assistance in the departments. The fellowship grant includes a stipend and remission of tuition.

## APPOINTMENTS

Appointments to fellowships and assistantships are ordinarily announced by April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed.

## FULL-TIME DUTIES

Graduate students who hold teaching assistantships and research fellowships, graduate co-operative teaching assistantships, or graduate co-operative research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisor and the Dean of the Graduate Division.

## NATIONAL DEFENSE STUDENT LOAN PROGRAM

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one half the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$2,500. The total of loans made to a student for all years, including any loans made to him as an undergraduate, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date the borrower ceases to carry, at an institution of higher education, at least one half the normal full-time academic workload as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, the cancellation rate is 15 per cent for each complete year of service; and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and appropriate application forms are available through the Graduate Division Office or from the Office of Financial Aid. The application deadline is September 1 for full-time students or one month prior to the start of the quarter for which aid is requested in the case of half-time students.

# GRADUATE SCHOOL



*Degree Program*  
*of*  
*The Graduate School*  
*of*  
*Business Administration*

## GENERAL INFORMATION

The Graduate School of Business Administration at Northeastern University is primarily a professional school in which the major objective is to develop practitioners of business administration. Most men and women who are enrolled presently are at the same time employed in various public and private organizations. These student-practitioners are working toward their degrees on a part-time basis.

An ever-increasing number of students in the Program are now pursuing their course on a full-time basis. Many hold teaching assistantships, tuition fellowships and research fellowships described elsewhere in this bulletin. These full-time students, usually recent recipients of undergraduate degrees, consider the opportunity to be in class with many experienced practitioners of business an outstanding advantage.

The Master of Business Administration Program is broad in concept and is aimed at preparing the student for a career in business administration rather than for an immediate or particular position. Toward the achievement of this objective, the curriculum and teaching methods center upon the development of basic skills and knowledge appropriate to business administration, rather than upon specialized functional techniques. Although the case method of study is used liberally, a wide variety of teaching methods is employed consonant with particular course objectives. The basic objectives are to confront the student with meaningful learning experiences, to increase skills and knowledge in the basic disciplines underlying business practice, and to develop judgment and the skills of analysis and decision-making which are so essential to the business manager.

In order to accommodate both the full-time and part-time student, courses are offered during the day, late afternoon, and early evening hours at both the Boston and Burlington campuses. The same faculty offers the same courses at both locations. The full-time student can expect to complete more than one-half of his program during the day if he so desires. Some courses in the elective area particularly must be completed during the late afternoon or early evening. The day courses are also available to the part-time student.

A part-time student may take a maximum of four hours of course work per term, while a full-time student must take a minimum of eight hours. The length of time involved to complete a program will depend upon the individual schedule followed. As the Academic Calendar indicates, it is possible to begin a program at any of four times during the year.

# ACADEMIC CALENDAR

## 1967-68

### Summer Session 1967

Registration Period for Former Students	Monday-Friday	May 29-June 4
*Interview and Registration Period for New Students	Monday-Friday	June 5-June 9
Classes Begin	Monday	June 19
Independence Day, No Classes	Tuesday	July 4
Classes End	Tuesday	July 25
Examination Period	Wednesday-Saturday	July 26-July 29

### Fall Quarter 1967

Registration Period for Former Students	Monday-Saturday	Aug. 7-Aug. 26
*Interview and Registration Period for New Students	Monday-Saturday	Aug. 21-Sept. 9
Classes Begin	Monday	Sept. 18
Columbus Day, No Classes	Thursday	Oct. 12
Thanksgiving, No Classes	Thursday-Friday	Nov. 23 & 24
Examination Period	Monday-Friday	Nov. 27-Dec. 1

### Winter Quarter 1967-68

Change of Registration for Former Students	Monday-Friday	Nov. 27-Dec. 1
*Interview and Registration Period for New Students	Monday-Friday	Nov. 27-Dec. 1
Classes Begin	Monday	Dec. 11
Christmas Vacation, No Classes	Saturday-Monday	Dec. 23-Jan. 1
Washington's Birthday, No Classes	Thursday	Feb. 22
Examination Period	Monday-Friday	Mar. 4-Mar. 8

### Spring Quarter 1968

Change of Registration for Former Students	Monday-Friday	Feb. 26-Mar. 1
Classes Begin	Monday	Mar. 18
Patriots' Day, No Classes	Friday	Apr. 19
Final Grades for June Graduates		
Taking Third Quarter Courses	Friday	May 24
Memorial Day, No Classes	Thursday	May 30
Examination Period	Monday-Friday	June 3-June 7

\*Appointments for interviews with new students must be made at least four days before the date of the interview.



**COMMITTEE ON  
GRADUATE STUDY  
IN  
BUSINESS ADMINISTRATION**

Daniel J. McCarthy, A.B., M.B.A., D.B.A., Chairman	Associate Dean of Business Administration, Director of the Graduate School of Business Administration, and Professor of Management
Charles H. Dufton, A.B., M.A.	Professor of Marketing and Advertising and Chairman of the Department
Joseph M. Golemme, S.B., M.A., C.P.A.	Professor of Accounting, Chairman of the Department, and Director of the Graduate School of Professional Accounting
James S. Hekimian, A.B., M.B.A., D.B.A.	Dean of Business Administration
Lyman A. Keith, B.S., M.A., M.B.A.	Professor of Business Management and Chairman of the Department
Arthur A. Vernon, S.B., M.S., Ph.D.	Dean of the Graduate Division
Edward R. Willett, B.S., M.A., Ph.D	Professor of Finance and Chairman of the Department

**FACULTY**

**Robert F. Abbanat** **Lecturer in Business Administration**  
B.S., M.S., Massachusetts Institute of Technology; M.B.A., Harvard University

**Dean E. Ammer** **Professor of Management and Director of the Bureau of Business and Economic Research**  
B.S., Massachusetts Institute of Technology; M.B.A., Ph.D., New York University

**Anker V. Andersen** **Associate Professor of Accounting**  
B.B.A., M.B.A., Ph.D., University of Minnesota

**Joseph C. Bailey** **Professor of Human Relations**  
A.B., University of Illinois; A.M., Ph.D., Colorado University

**Milton Budoff** **Lecturer in Business Administration**  
M.A., Ph.D., University of Chicago

**Charles W. Collazzo, Jr.** **Associate Professor of Marketing**  
B.A., Northeastern University; M.C.S., M.A., Boston University; Ph.D., Columbia University

**Joel Corman** **Assistant Professor of Management**  
A.B., Brandeis University; M.B.A., Wharton School, University of Pennsylvania

**Roger Allen Cossaboom** **Assistant Professor of Finance**  
B.S.I.E., Northeastern University; M.B.A., Michigan State University

**Joseph Richard Curran** **Assistant Professor of Accounting**  
B.S., M.B.A., Northeastern University

**Ernest M. DeCicco** **Associate Professor of Economics**  
B.S., A.M., University of New Hampshire; Ph.D., Boston University

**James W. Earley** **Lecturer in Business Administration**  
A.B., Holy Cross; B.S., State Teachers College; M.B.A., Northeastern University

**Ralph W. Fingar** **Lecturer in Business Administration**  
B.S., Union College; Ph.D., University of Texas

**Frederick V. Fortmiller** **Lecturer in Business Administration**  
A.B., M.B.A., Harvard University

<b>Bernard L. Friedman</b>	<b>Lecturer in Business Administration</b>
B.S., M.B.A., Northeastern University	
<b>Edward Youssef George</b>	<b>Associate Professor of Management</b>
B.Sc., M.A., Cairo University; B.A., American University; Ph.D., New School for Social Research	
<b>Paul W. Glennon</b>	<b>Lecturer in Business Administration</b>
B.B.A., LL.B., Northeastern University; M.B.A., Boston University; L.L.M., J.S.D., New York University	
<b>Joel David Goldhar</b>	<b>Assistant Professor of Management</b>
B.Ch.E., Rensselaer Polytechnic Institute; M.B.A., Harvard University	
<b>Harold M. Goldstein</b>	<b>Associate Professor of Economics</b>
B.A., Northeastern University; M.A., Boston College; Ph.D., Clark University	
<b>Sidney Herman</b>	<b>Associate Professor of Economics</b>
B.S., Northeastern University; M.B.A., New York University	
<b>Irwin L. Herrnstadt</b>	<b>Associate Professor of Economics</b>
A.B., Columbia University; Ph.D., Massachusetts Institute of Technology	
<b>Richard B. Higgins</b>	<b>Assistant Professor of Management</b>
A.B., Tufts University	
<b>John G. Jenkins</b>	<b>Associate Professor of Marketing</b>
A.B., Cambridge University (England); M. Com., University of Toronto; D.B.A., Harvard University	
<b>Ralph C. Jones</b>	<b>Professor of Accounting</b>
B.S., M.S., University of Illinois; Ph.D., Yale University	
<b>Howard T. Lewis</b>	<b>Lecturer in Business Administration</b>
B.A., Lawrence College; M.A., University of Wisconsin; LL.D., Harvard University	
<b>Richard Lindhe</b>	<b>Associate Professor of Accounting</b>
B.S., M.Ed., Kent State University; Ph.D., University of Chicago	
<b>Ward C. Low</b>	<b>Lecturer in Business Administration</b>
B.S., University of Wyoming; Ph.D., Boston University	

<b>Ivory L. Lyons</b>	<b>Associate Professor of Economics</b>
A.B., Morehouse College; A.M., Ph.D., Harvard University	
<b>Wesley Wooley Marple, Jr.</b>	<b>Associate Professor of Finance</b>
A.B., Princeton University; M.B.A., D.B.A., Harvard University	
<b>Daniel J. McCarthy</b>	<b>Professor of Management and Associate Dean of Business Administration</b>
A.B., M.B.A., Dartmouth College; D.B.A., Harvard University	
<b>Robert J. Minichiello</b>	<b>Associate Professor of Marketing</b>
A.B., Harvard University; M.B.A., Boston University; D.B.A., Harvard University	
<b>Richard J. Morrison</b>	<b>Assistant Professor of Marketing</b>
B.A., M.B.A., Harvard University	
<b>Robert Mullins</b>	<b>Associate Professor of Management</b>
M.B.A., D.B.A., Harvard University	
<b>A. Howard Myers</b>	<b>Professor of Industrial Relations</b>
A.B., Cornell University; M.A., Ph.D., Columbia University	
<b>Robert G. Neville</b>	<b>Lecturer in Business Administration</b>
A.B., Princeton University; M.B.A., Harvard University	
<b>Andre P. Priem</b>	<b>Assistant Professor of Management</b>
B.B.A., M.A., University of Cincinnati	
<b>Michael Reiter</b>	<b>Lecturer in Business Administration</b>
B.A., Hebrew University; Ph.D., University of Texas	
<b>Robert Jay Rosendorff</b>	<b>Instructor in Finance</b>
B.A., Boston University; M.B.A., Washington University	
<b>Anghel N. Rugina</b>	<b>Professor of Economics and Finance</b>
B.S., College of Business, Galatz, Rumania; M.A., Ph.D., Academy of High Studies in Economics, Bucharest, Rumania; Ph.D., University of Freiburg, Germany	
<b>Richard W. Safford</b>	<b>Lecturer in Business Administration</b>
B.S., Union College; M.S., University of Michigan; Ph.D., Massachusetts Institute of Technology	
<b>John N. Samaras</b>	<b>Associate Professor in Management</b>
A.B., Boston University; M.B.A., Dartmouth College; D.B.A., Harvard University	

**Donald Shelby**

B.A., University of Cincinnati; Ph.D., University of California at Berkeley

**James Saul Shulman Associate Professor of Business Administration**

B.A., Tufts University; M.B.A., D.B.A., Harvard University

**Gerald A. Simon****Lecturer in Business Administration**

B.B.A., City College of New York; M.B.A., Harvard University

**Albert Slavin****Professor of Accounting**

Ed.B., Ed.M., Boston University

**Frank L. Turgeon****Lecturer in Business Administration**

B.S., Georgetown University; M.B.A., Ph.D., New York University

**Joseph M. Wood****Assistant Professor of Business Administration**

B.A., University of Delaware; M.A., Ph.D., Harvard University

**Jehiel Zif****Assistant Professor of Marketing**

B.S., Technion-Israel; M.B.A., Ph.D., New York University



## **MASTER OF BUSINESS ADMINISTRATION PROGRAM**

### **Admission**

To be enrolled for graduate work in business administration, applicants must have done undergraduate work of high quality, and must have obtained a bachelor's degree from a recognized university or institute of technology. The quality of undergraduate work is considered to be of more importance than the particular field of undergraduate specialization.

A transcript of undergraduate grades must be made available to the Graduate School of Business Administration no later than the time of the personal interview. It is in all cases the responsibility of the individual applicant to see that this requirement is met.

### **Admissions Test for Graduate Study in Business**

All applicants for admission must take this examination administered by the Educational Testing Service of Princeton, New Jersey. The test is offered several times during the year at universities throughout the country, usually in July, November, February, and April.

In only very rare instances will an applicant be allowed to begin a program before the University has received his test score. It is, therefore, recommended that applicants take the test well in advance of the time they will apply for admission. In no case is an application for admission considered complete without the test score.

### **Prerequisite Courses**

In the cases of some applicants, deficiencies may exist in their undergraduate preparation in the areas of mathematics, statistics, or economics. Since satisfactory completion of work in these areas is required for the Graduate School of Business Administration, such deficiencies must be overcome. To facilitate this process, applicants accepted into the Program may register for these courses, which carry undergraduate credit, as part of their academic program.

Generally, all prerequisite courses must be completed before enrolling in graduate credit courses. Individual cases, however, will be considered, particularly for full-time students.

### **The Interview**

A personal interview will be scheduled for all applicants to the Master of Business Administration Program. The interview schedule is noted in the Academic Calendar.

If distance prohibits an interview, a decision regarding admission will be made without an interview, but at the time of registration the applicant must review his program with the Director of the Graduate School of Business Administration.

### Non-Continuous Study

In some cases, students withdraw from the Program for a quarter or a longer period of time. Any student who was not registered for courses during the previous quarter may not subsequently register for courses without first discussing his situation with the Director of the Graduate School of Business Administration.



# MASTER OF BUSINESS ADMINISTRATION CURRICULUM

Effective 1967

## Required Courses

Each student must take 28 quarter hours of credit in the following required courses:

41.800	Accounting for Managerial Control	45.801	Production I
41.801	Control I	45.802	Production II
41.802	Control II	45.811	Human Relations and Organizational Behavior I
43.801	Marketing I	45.812	Human Relations and Organizational Behavior II
43.802	Marketing II		
44.801	Finance I	45.821	Business Policy I
44.802	Finance II	45.822	Business Policy II
	39.805 Business Cycles and Forecasting or 49.910 Managerial Economic Analysis		

## Elective Courses and Fields of Concentration

In order to complete the degree requirements, 14 quarter hours of credit must be taken from elective courses with a maximum of eight quarter hours of credit from any single field of concentration. The elective courses and the fields of concentration are as follows:

FINANCE		PRODUCTION	
44.901	Finance III—Advanced Financial Management	45.901	Production Process Analysis and Techniques
44.921	Investment Analysis	45.902	Planning and Control of Manufacturing Operations
44.923	Seminar in Strategies for Growth Funding	45.911	Manufacturing Policy
44.925	Investment Management of Financial Institutions		
MARKETING		HUMAN RELATIONS	
43.912	Dynamics of Marketing Management	45.951	Executive Development
43.921	Advertising Management	45.953	Organizational Behavior
43.931	Marketing Research	45.971	Industrial Relations I
43.941	Industrial Marketing	45.972	Industrial Relations II

<b>ECONOMICS</b>		<b>QUANTITATIVE METHODS</b>
39.823	Government Finance	49.901 Quantitative Methods I—Application of Statistical Analysis
39.825	Fiscal Policy	
39.827	Economic Development	49.902 Quantitative Methods II—Linear Programming
39.829	Comparative Economic Systems	
39.831	Money and Banking	49.903 Quantitative Methods III—Indeterministic Models
39.833	International Economics	
39.835	Labor Economics	

### **General Electives**

- 45.957 Written Communication in Business
- 45.960 Organizational Theory in Industrial Practice
- 45.962 The Institutional Environment of Business
- 45.963 American Business History
- 45.965 Management of Small Business Enterprises
- 45.966 Industrial Procurement and Materials Management
- 45.967 Management of Intangible Corporate Assets
- 45.969 Government and Business
- 45.983 Management Analysis and Decision-Making
- 45.985 Management of Research and Development
- 45.987 Strategic Planning and Decisions
- 45.991 Business Law I
- 45.992 Business Law II
- 49.915 Management Information Systems I
- 49.916 Management Information Systems II
- 49.950 Seminar in Capital Budgeting

### **Electives From Other Graduate Schools**

Courses may also be selected from other programs of the Graduate Division at Northeastern University with the permission of the Director of the appropriate program and Director of the Graduate School of Business Administration. For instance, students with the proper background may register in the Graduate School of Engineering for Operations Research for Management, Inventory Control and Production Planning, and other courses consistent with a program leading to the Master of Business Administration degree.

# **DESCRIPTION OF COURSES**

## **Prerequisite Courses**

The following undergraduate courses are offered for those whose undergraduate preparation for the Master of Business Administration Program has been incomplete or is not current.

**10.501, 10.502, 10.503 Mathematics I, II, III** Prep. None

Methods and applications of algebra; graphical techniques, exponents and logarithms; interest, time payments, and investment; introduction to statistics and probability.

**39.501 Principles of Economics** Prep. None

Development of macro-economic analysis; review of national income accounting and concepts; national income determination, fluctuation, and growth; contraction and expansion analyzed through the circular flow of money payments; role of the banking system and the Federal Reserve System; government expenditures and taxation; international trade: balance of international payments, law of comparative advantage, tariff protection versus free trade.

**39.502 Principles of Economics** Prep. 39.501, Principles of Economics

Comprehensive analysis of the economics of the firm with illustrative cases. Demand, cost and output relationships examined under marginal analysis and alternatives, such as break-even charts, cost-plus pricing and sales maximization. Market structures, factors of production, and investment given special treatment. Market structures and the public interest includes examination of anti-trust policy, economic efficiency, research and innovation, advertising and economic concentration. Discussion of theory versus practice.

**39.511 Statistics** Prep. None

An intensive four-quarter-hour course in the fundamental principles of probability statistics as applied to the decision-making procedure in business. Statistical decision-making, based on sample information, is analyzed thoroughly after an introduction to decision-making generally. Basic sampling techniques for estimating population characteristics, designed to aid the business manager in the decision-making procedure, are covered fully.

## Required Courses

All courses carry two quarter hours of credit unless otherwise specified.

### 39.805 Business Cycles and Forecasting

Prep. Statistics and  
Basic Economics

The theory of models is used to show that the business cycle phenomenon varies in accordance with the economic and social system implied, and that there is an economic model (the Walrasian system) where the phenomenon cannot exist, at least not in the form that we know from the history of modern capitalism. The major business-cycle theories are introduced for the purpose of demonstrating their application in forging consistent and efficient policies. A statistical history of fluctuations in business activity of the United States forms the background for a judgment on policies and their effectiveness.

### 41.800 Accounting For Managerial Control

Prep. None

Prepares all students for work in Control I and Control II. Initial weeks are spent discussing the accounting process based on a programmed text. The remainder of the course explains how accounting data can be interpreted and put to use in controlling and planning business activities. In general, the problems of business are examined from the point of view of internal management.

### 41.801 Control I

Prep. 41.800, Accounting for Managerial Control

Management control, the process by which managers assure that resources are obtained and used effectively and efficiently in the accomplishment of an organization's objectives. The course covers three processes: (1) Operational control, which is the process of assuring that specific tasks are carried out effectively and efficiently. (2) Information-handling, which is the process of collecting, manipulating, and transmitting information, whatever its use is to be. (3) Financial accounting, which is the process of reporting financial information about the organization to the outside world.

### 41.802 Control II

Prep. 41.801, Control I

A continuation of Control I.

### 43.801 Marketing I

Prep. Basic Economics and 41.800,  
or Managerial Accounting

The objectives of Marketing I and Marketing II are twofold: to provide the student with a broad but comprehensive understanding of basic marketing functions, institutions, concepts, and tools of analysis; and to develop effective programs of action. Special attention is given to the role of the consumer, product policy, channels of distribution, pricing, advertising, personal selling, sales promotion, marketing research and the marketing management function.

**43.802 Marketing II**

Prep. 43.801, Marketing I

A continuation of Marketing I.

**44.801 Finance I**

Prep. 41.800 or Managerial Accounting; Statistics;  
Basic Economics

A basic understanding of analytical skills and concepts which are appropriate to evaluating the financial aspects of business decisions and to provide practice in their application. Of chief concern are normal business operating decisions which require that the firm acquire and allocate funds so as to meet its profit and other goals. Finance I concentrates on the frequent managerial decisions which tend to employ funds for short periods of time.

**44.802 Finance II**

Prep. 44.801, Finance I

Continuation of Finance I, but concentration is on managerial decisions which tend to commit the firm's funds for long time periods with a greater degree of uncertainty than is involved in decisions for shorter periods of time.

**45.801 Production I**

Prep. 41.800 or Managerial Accounting;  
Statistics, and Mathematics

The production process as an integrated system responding to the firm's goals and objectives. Explores from a manager's viewpoint (1) the nature of the short- and long-range problems generated within the production system; (2) factors in plant layout and the firm's physical facilities; and (3) the cost-data required for decisions about production; including capital costs and investment criteria. Topics covered include: management's function in production-system design, process planning, automation, work methods, job structure, job enlargement, and participation. Text and cases are used.

**45.802 Production II**

Prep. 45.801, Production I

Continuation of the study of management of the production system, exploring (1) the utility of standards and work measurement; (2) usefulness for production control of various analytical techniques, such as waiting line theory, simulation and linear programming; and (3) the operation and control of the production system. Topics covered include: management of inventory control, production-inventory systems, maintenance, quality, and improvement of production cost. Text and cases are used.

**45.811 Human Relations and Organizational Behavior I**

Prep. Managerial Accounting

The basic purpose is to give the student an opportunity to develop a way of thinking about human behavior in organizations that will enable him to play an effective administrative role. Emphasis is on analysis of individual behavior in the organizational setting. The objective is to give the student an opportunity to improve his skill in understanding others as

well as his ability to communicate. Analysis of small group behavior and superior-subordinate relations is also included. Case studies and role plays provide the techniques to develop these skills.

**45.812 Human Relations and Organizational Behavior II**

Prep. 45.811, Human Relations and Organizational Behavior I

A continuation of Human Relations and Organizational Behavior I. Emphasis is on the analysis of intergroup relations and the understanding of the process of change in the organization.

**45.821 Business Policy I**

Prep. All other required courses except 45.822

An understanding of corporate strategy and its elements including an analysis of the company, its resources and opportunities, its environment, and its decision-makers. This first course in Policy will be concerned primarily with the process of analyzing an overall company situation with emphasis on internal resources and external opportunities.

**45.822 Business Policy II**

Prep. 45.822, Business Policy I

A continuation of Business Policy I with further emphasis on objectives, both corporate and personal, as major elements of corporate strategy. More emphasis on decision-making and implementation of strategy, building upon analytical work of Policy I.

**49.910 Managerial Economic Analysis**

Prep. 41.800 or Managerial Accounting; Statistics; Basic Economics

How economic analysis can be applied to decision-making. Its emphasis is on the use of analysis in clarifying problems, in organizing and evaluating information, and in comparing alternative courses of action. Its concern is with those analytical tools that are useful and will improve decision-making.

## Elective Courses

### ECONOMICS

**39.823 Government Finance** Prep. Basic Economics  
A survey of governmental expenditure, revenue, and debt systems, with emphasis upon their economic effects and their relationships to principles of economic welfare. Discussions on taxation, tax incidence, tax theory, debt management and employment levels.

**39.825 Fiscal Policy** Prep. 39.823, Government Finance or Equivalent  
Deliberate adjustments in revenues and expenditures for the purpose of obtaining greater economic stability and economic growth. Discussion on neutral fiscal policy, built-in stabilizers, budget management, attainment of full employment, inflation and deflation.

**39.827 Economic Development** Prep. Basic Economics  
The enumeration, delineation, and assessment of variables which determine the level and the nature of economic activity. An introductory discussion of the economic factor in civilization is followed by an examination of the psychological, social, and political influences on economic change. The role of various economic institutions in secular development is analyzed.

**39.829 Comparative Economic Systems** Prep. Basic Economics  
A comparative study of central economic theories and institutions of Capitalism, Socialism, Communism, Welfare State. Particular attention to criteria for evaluating success in meeting diverse goals, techniques and problems of planning, and real growth rates. Some attention paid to primitive economies.

**39.831 Money and Banking** Prep. Basic Economics  
The necessary information for an understanding of the nature and functioning of the monetary and banking system of the United States as well as of any other country of the modern era. The theory of models is used to show how many monetary and banking systems are possible, and how the solution to a given problem (both in theory and practice) depends on the model selected. Thus, in a scientific treatment, theory and policies are interrelated in the same sense that a good practical solution has to rely upon good analysis. Monetary issues of international nature are discussed.

**39.833 International Economics** Prep. 39.831, Money and Banking or Equivalent and Basic Economics  
The historical background of the Balance of International Payments of the United States. To understand the nature of the problems in this field, central attention is given to the theory of international trade and capital movements. Further attention is paid to the interpretation and evaluation

of the various possible foreign economic policies. Trade agreements and restrictions are also included as a part of the greater issues of international economic development and cooperation.

39.835 Labor Economics

Prep. Basic Economics

The economics of wage determination, impact of unions on wages and inflation, the economics of full employment and unemployment, and private and public remedial policies; the labor force, government labor legislation, security, unionism and democracy.

## **MARKETING**

43.912 Dynamics of Marketing Management Prep. 43.802, Marketing II

A capstone marketing course which focuses on the marketing executive's task of interrelating the various functional activities within his department and integrating the resulting marketing programs with the short- and long-term objectives of the firm. Case studies and supplementary readings.

43.921 Advertising Management

Prep. 43.802, Marketing II

The ability of advertising to contribute—in large or small measure—to marketing in a variety of business situations. Examined from a top-management point of view. The student is faced with the problem of formulating marketing programs with appropriate emphasis upon advertising. Case analyses and discussions, supplemented by background readings.

43.931 Marketing Research

Prep. 43.802, Marketing II

The major methods and models of marketing research are examined in order to give the line user an understanding of the function of research in decision-making. Specific topics include marketing research as a system of information; information from surveys, information from experiments, economic value of information, sales forecasting and control, and selected applications. Cases, problems and a research project.

43.941 Industrial Marketing

Prep. 43.802, Marketing II

The problems of industrial concerns in selling their products and services to other industrial customers are studied, first at the salesman's level, then at the area manager's level, and finally at the level of the company sales executive. Emphasis on determining the customer's needs and finding ways to meet these needs. Areas covered include the role of purchasing agent, industrial salesman's problems, supervisory problems, product planning, and marketing programs for industrial products and services.

FINANCE

44.901 Finance III—Advanced Financial Management

Prep. 44.802, Finance II

An opportunity to study several important areas of financial management in greater depth than was possible in the basic finance courses. Some of

the topics are corporate capital structure, dividend policy, capital budgeting, and the management of current assets. Instruction is primarily through assigned readings and classroom case discussions.

**44.921 Investment Analysis**

Prep. 44.802, Finance II

Investment principles and risks. The objective will be the development of a sound investment program with attention being given to identification of investment objectives and risks. Emphasis will be placed on the techniques of analysis and evaluation of various types of securities and the associated risks, the operation of the securities markets, and the various methods of portfolio management.

**44.923 Seminar in Strategies for Growth Funding**

Prep. 44.802, Finance II

A course with a narrowed scope dealing, in depth, with concepts and practices of designing capital structures to accommodate corporate growth. The planning and implementation of funding actions is becoming as complex and as necessary to corporate success as the conception, engineering and production of quality products. Published and unpublished research material will be utilized along with classroom discussions of published cases and of "live case" presentations by visiting practitioners. The purpose of the course is to increase our understanding of management's opportunities to influence the supply of financial resources available to their firm.

**44.925 Investment Management of Financial Institutions**

Prep. 41.802, Control II; 44.802, Finance II

The knowledge and understanding of investment principles as they relate to commercial banks, savings banks, insurance companies, finance companies, investment companies, endowments and trusts. Emphasis is on the influence of business conditions, fiscal and monetary policy, and general government economic policy on institutional liabilities related to assumption of risk, the evaluation of risk, and development of lending and investment policies for various institutions. Readings and case studies are used.

**PRODUCTION****45.901 Production Process Analysis and Techniques**

Prep. 45.802, Production II

The resolution of tractable production-management problems identified through process analysis. The student should develop skill in process analysis and the ability to evaluate analytical concepts and techniques. Topics covered include the identification of complex economic and technological factors in a firm's environment. Production-management readings and cases are used.

**45.902 Planning and Control of Manufacturing Operations**

Prep. 45.802, Production II

Cases and reading assignments deal with day-to-day problems of the factory manager, the middle-management group, and the front-line supervisor. Each case presents a specific problem for which a definite solution must be reached, often within a time limit. Emphasis is placed on solving immediate problems within the framework of existing policies by co-ordinating the resources at hand. Cases and readings are used.

**45.911 Manufacturing Policy I**

Prep. 45.802, Production II

The functional interrelationship of major manufacturing decisions facing management. Exploration of the nature of situations of such scale and complexity that the total production resources of the firm must be considered together with financial, marketing, competitive, and other policy elements to arrive at a decision. Provides skill in the analysis of the production process, useful to the manufacturing vice president or the investment analyst who must consider the total industry for major company decisions. Text and cases are used.

**HUMAN RELATIONS****45.951 Executive Development**

Prep. 45.812, Human Relations II

An executive and the organizational and personal situation in which he must be equipped to function. Theory of leadership, experiment in established development techniques, practice in individual and group improvement methods. Management by objectives, group dynamics, case, incident, and conference method are reviewed. Coaching, performance appraisal, interviewing, reading, listening and report writing are analyzed as essentials of executive development and achievement.

**45.953 Organizational Behavior**

Prep. 45.812, Human Relations II

In essence an extension of Human Relations I and II, considers the individual and the organization in more depth. Necessary for an in-depth understanding of organizations and how they function and to understand the social and organizational aspects of human behavior.

**45.971 Industrial Relations I**

Prep. 45.812, Human Relations II

or Equivalent

Significant developments of industrial relations and employment theory; the principles of personnel management and of management-union relations; policy considerations for the managing of manpower resources; policy impact of current developments in work theory, in staffing, in training and development in compensation and benefit programs. Communications and morale; theoretical and case discussion.

**45.972 Industrial Relations II**Prep. 45.971, Industrial Relations I  
or Equivalent

Labor policy in relation to management unions and the public; management-union relations as joint control over human resources of organizations, private and public; the labor movement and collective bargaining; work rules and productivity; labor disputes and supplements to negotiations; political and economic power; legal responsibilities of labor and management; management authority, employee discipline; types of management-union relations. Theories and cases.

**QUANTITATIVE METHODS****49.901 Quantitative Methods I—Applications of Statistical Analysis**

Prep. College Algebra and Basic Statistics

Application of statistical analysis on the computer, including time series, regression analysis, and variance analysis. Introduction to computer programming principles; students will program and use computer. All required mathematical concepts will be introduced and covered.

**49.902 Quantitative Methods II—Linear Programming**

Prep. Quantitative Methods I or Equivalent

Covers matrix algebra and in-depth treatment of linear programming; topics include simplex, duality, and regression models. All concepts will be programmed on computer by students.

**49.903 Quantitative Methods III—Indeterministic Models**

Prep. Quantitative Methods II or Equivalent

Covers statistical decision theory, Bayesian probability, Markov chains, poisson and random variables, game theory, inventory control, and introduction to simulation.

**GENERAL ELECTIVES****45.957 Written Communication in Business**

Prep. Basic Economics

How to write business reports with clarity and coherence. Review of the rules of grammar, usage, style, and structure; collective criticism of students' papers and other writings; written analyses of cases; and critical evaluations of important books in the literature of business administration. One paper a week is normally required.

**45.960 Organizational Theory in Industrial Practice**

Prep. 41.800 or Managerial Accounting, and Basic Economics

An analysis of the statics and dynamics of organization structure and behavior. Beginning with a study of such organization concepts as hierarchy, specialization, and authority, the course proceeds to examine a variety of external and internal forces which impinge on organization, frequently demanding change in organization itself. Indeed, a measure of organizational effectiveness may well be its alertness in responding to the requirements and opportunities in its external environment, at the same time

maintaining an organization climate which is sensitive to the internal demands placed upon it.

Within this broad conceptual scheme and using selected readings, company histories and case analyses, the following kinds of questions will be explored: What external and internal forces may demand change in organizations? What is the nature of these forces for change? Do they conflict or mutually reinforce one another? How is the need for change recognized and translated into new organizational forms?

**45.962 The Institutional Environment of Business** Prep.  
Ten Quarters of Graduate Credit

The relationship of the business corporation to various elements in its environment; political, social, economic, scientific and educational. Developing interactions and mutual responsibilities with emphasis on initiating and planning to affect these external institutional relations rather than only to react. Responsibilities of business and of businessmen.

**45.963 American Business History** Prep. Basic Economics

Religion and the rise of capitalism, the Industrial Revolution, theories of American economic growth, the influence of the frontier on the American economy, the rise of big business, the gilded age, the role of the entrepreneur, the development of the corporation, and changing relations between business and government and between business and labor. Lectures, class discussion, and written evaluations of important writings in the field.

**45.965 Management of Small Enterprises** Prep. 41.800,  
or Managerial Accounting; 43.801, Marketing I;  
44.801, Finance I; 45.801, Production I

Problems in various phases of the management of a new or small business. An appraisal of risk as well as reward is made for business opportunities. Problems range from locating, evaluating, and financing a small business to those of survival and growth in a going concern.

**45.966 Industrial Procurement and Materials Management** Prep. Managerial Accounting and Economics

The management of the production materials and inventory, with special reference to procurement of the material involved. Text and cases are used.

**45.967 Management of Intangible Corporate Assets** Prep. 45.802, Marketing II

Non-operating profit income possibilities from research and development (commercial and industrial); definition of intrinsic value; uses of business know-how; trade secrets; industrial intellectual property; government-contract data problems in establishing second-source vendors; copyright

income; use of intellectual business property as vehicle for market penetration of new business development through licensing agreements; maximum utilization of corporate intangible resources to improve the profit picture; analytical investigation of selected companies through seminar approach.

**45.969 Government and Business**

Prep. Basic Economics

The expanding scope of the government's economic and socio-economic activities is bringing about a much closer relationship between government and business. The course analyzes the role of government as a regulating force, as well as the nature and impact of government fiscal, economic, and socio-economic policies upon the conduct of business. The political and economic philosophies behind greater government participation in the economic structure of the nation as indicated by public-utility, antitrust, labor, and socio-economic legislation.

**45.983 Management Analysis and Decision-Making**

4 Q.H. Prep.

Basic Economics and Managerial Accounting

The decision-making process within the broad business environment. Case analysis will be the basic means through which this process is examined. The case facts and their relationships to problems and issues shall be considered in making decisions. The reasoning and considerations that affect a decision are to be communicated by means of written expression. Therefore, a well-organized and considered written analysis will result from a logical approach to decision-making.

**45.985 Management of Research and Development**

Prep. 41.800,

Managerial Accounting, Basic Economics

Corporations undergoing rapid growth have done so far the most part because their technical programs were better managed than their competitors. This course focuses on the unique problems of R & D Management through readings and case studies which bring out the important considerations involved in (1) dealing with scientists and engineers as individuals, (2) planning, organizing and controlling research, (3) staffing and compensating scientists, and (4) in establishing a climate for research.

**45.987 Strategic Planning and Decisions**

Prep. 41.800, Managerial

(Formerly 43.911, Marketing Policy)

Accounting; 43.801,

Marketing I; 44.801, Finance I; 45.801; Production I

Based on a Business Management Computer game in which the student becomes a member of the management team of a manufacturing company, simulated in Northeastern's computer center, and is given responsibility for decision-making in a competitive environment. The relationships between marketing, finance, manufacturing, and business policy are clarified. Readings and lectures supplement the decision-making exercise.

45.991 Business Law I

Prep. 41.800, Managerial Accounting,  
Basic Economics

With the legal form of the business organization as a focal point—proprietorship, partnership, corporation—the course examines the legal problems concerning the organization, the long-term financing, the acquisition of property, and the sales functions of the various entities in such a way that the legal and financial aspects are continuously related as the businessman encounters them. The Uniform Commercial Code is emphasized throughout the course.

45,992 Business Law II

Prep. 41.800, Managerial Accounting, Basic Economics

The legal and financial principles concerning short-term financing with particular reference to Articles 3 and 9 of the Uniform Commercial Code, the regulatory laws which influence and determine business practices and competition, and the adjustment of a debtor's financial problems both outside the courts and through bankruptcy and rehabilitation proceedings in the federal courts.

**49.915 Management Information Systems I** (Formerly 45.981)

Prep. Ten Quarter Hours of Graduate Credit

The objective is to help the student to develop a new context in which management information systems (MIS)—past, present, and future—can be viewed in clear perspective. A management-science approach is taken which emphasizes the importance of dynamic patterns of behavior which determine the success of any enterprise. Means are introduced by which to analyze the closed-loop feedback structures which determine such patterns. Assuming no prior familiarity with computers, the student is brought to a point where he can begin to evaluate possible changes in any given Management Information Systems. Class discussions are based on individual experiences, case studies, and reading assignments.

49.916 Management Information Systems II

Prep. 49.915 or

45.981. Management Information Systems I

Student simulation of closed-loop management systems will provide a basis for demonstrating the controlling characteristics of dynamic response-patterns in any enterprise. Based on the philosophy, techniques, and structures developed in MIS I, selected classes of changes in system-parameters and structures will be studied. No computer skill is required for the student to operate in his role of manager, experimenting with his organization and its environment. Marginal utilities of investments are measured quantitatively as they bear upon alternative management objectives. Explicit treatments of management perceptions, psychological parameters, time delays, and random fluctuations or errors are included.

**49.950 Seminar in Capital Budgeting**

Prep. 41.802, Control II;

44.802, Finance II

A course with a narrowed scope dealing in depth with the managerial and financial problems concerning the allocation of corporate resources to long-term uses within the firm. The problems to be considered include the encouragement of the development of investment opportunities, as well as systems and techniques for their evaluation and selection. The goal of the course is to enhance the individual's ability to affect the selection of investment opportunities in a way which will make a maximum contribution to the development of the firm.





## COLLEGES AND UNIVERSITIES ATTENDED BY M.B.A. STUDENTS AS UNDERGRADUATES

Akron, University of	Dartmouth College
Albion College	Detroit, University of
Alfred University	Drexel Institute of Technology
American International College	Don Bosco College
American University	Duquesne University
Antioch College	
Arizona State University	
Arkansas, University of	Eastern Illinois State College
Athens, University of (Greece)	Eastern Nazarene College
Auburn University	Eastern Michigan University
Babson Institute of Business Administration	Franklin and Marshall College
Bard College	
Bates College	George Washington University
Bentley College	Grove City College
Bishop's University (Canada)	
Boston College	Harvard University
Boston University	Havana, University of (Cuba)
Bowdoin College	Haverford College
Bradford Durfee Institute of Technology	Hillyer College
Brandeis University	Hofstra College
British Columbia, University of (Canada)	Hunter College
Brooklyn Polytechnical Institute	
Brown University	Illinois Institute of Technology
Bryant College	Illinois, University of
Bucknell University	Iona College
Buffalo, University of	Iowa State University
	Israel Institute of Technology (Israel)
California, University of	Johns Hopkins University
California, University of (Los Angeles)	
Carleton College	
Carnegie Institute of Technology	Kenyon College
Carthage College	Kingston Technical College (England)
Case Institute of Technology	
Chicago, University of	Lafayette College
Cincinnati, University of	LaGrange College
City College of New York	Lehigh University
Clark University	Loughborough College (England)
Clarkson College of Technology	Lowell Institute of Technology
Colgate University	
College of the Holy Cross	
Colorado College	
Colorado State University	Maine, University of
Colorado, University of	Manhattan College
Colby College	Marietta College
Columbia University	Marquette University
Cornell University	Maryland, University of
Connecticut, University of	Massachusetts College of Art
Cooper Union	Massachusetts College of Pharmacy

Massachusetts Institute of Technology  
 Massachusetts Maritime Academy  
 Massachusetts State College at Fitchburg  
 Massachusetts, University of  
 McGill University (Canada)  
 Merrimack College  
 Miami, University of  
 Michigan State University  
 Michigan Technological University  
 Michigan, University of  
 Middlebury College  
 Minnesota, University of  
 Mississippi State University  
 Missouri School of Mines

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 Portland, University of  
 Princeton University  
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 Pratt Institute of Technology  
 Purdue University

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 Quinnipiac College

Radcliffe College  
 Redlands, University of  
 Regis College  
 Rensselaer Polytechnic Institute  
 Rhode Island School of Design  
 Rhode Island, University of  
 Richmond, University of  
 Rider College

Rochester Institute of Technology  
 Rutgers University

St. Anselm's College  
 St. Francis Xavier University (Canada)  
 St. Joseph's College  
 St. Lawrence University  
 St. Louis University  
 St. Michael's College  
 St. Olaf College  
 San Francisco, University of  
 San Jose State College  
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 Scranton, University of  
 Seton Hall University  
 Skidmore University  
 South Carolina, University of  
 Southern Massachusetts Technical Institute  
 Southern Missionary College  
 State College of New York at Buffalo  
 State College at Salem (Massachusetts)  
 State College at Worcester (Massachusetts)  
 Stevens Institute of Technology  
 Stonehill College  
 Syracuse University

Thammasat University (Thailand)  
 Toronto, University of (Canada)  
 Tri-State College  
 Tufts University

Union College  
 U. S. Coast Guard Academy  
 U. S. Merchant Marine Academy  
 U. S. Military Academy  
 U. S. Naval Academy

Vermont, University of  
 Virginia Polytechnic Institute  
 Virginia, University of

Wakayama, University of (Japan)  
 Washington and Jefferson College  
 Wayne State University  
 Wesleyan University  
 Western Michigan University  
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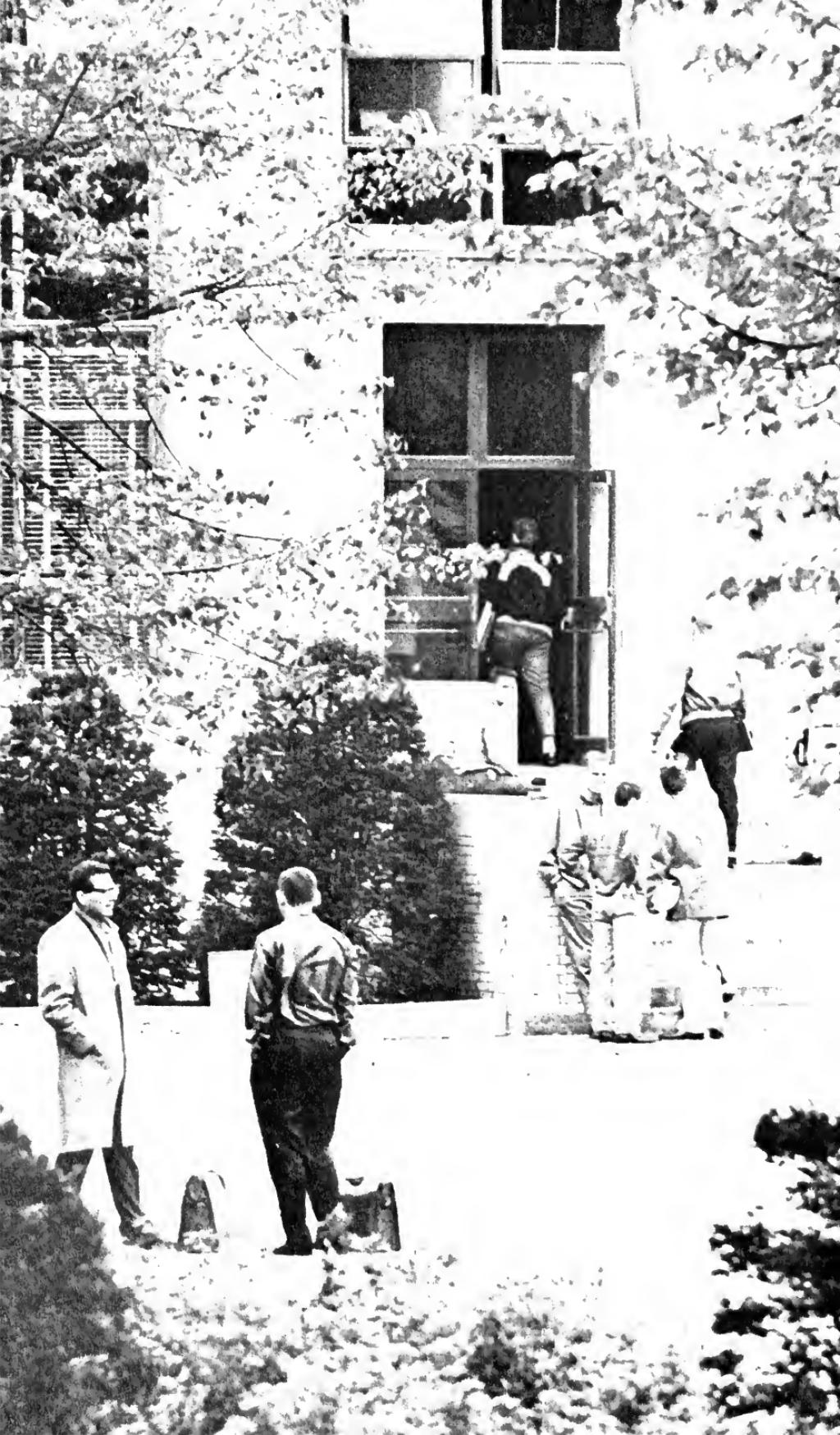
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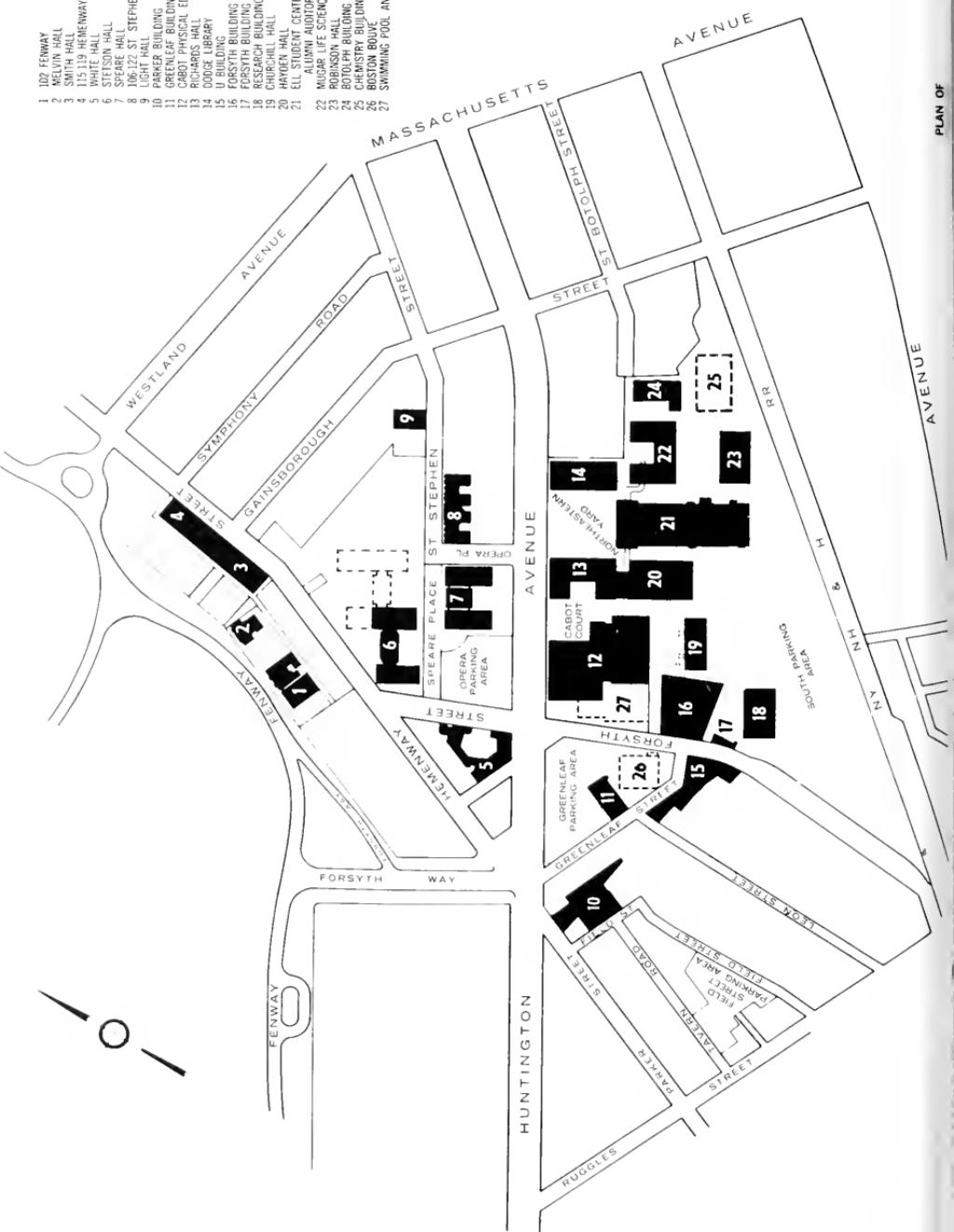


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- 3 SMITH HALL
- 4 115-19 HEMENWAY STREET
- 5 WHITE HALL
- 6 STEISON HALL
- 7 SPEER HALL
- 8 106-127 ST. STEPHEN STREET
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Byron K. Elliott

Chandler Hovey

E. Douglas Kenna

John Lowell

Lawrence H. Martin

Augustin H. Parker, Jr.

William M. Rand

Earl P. Stevenson

Earl H. Thomson

## CLASS OF 1969

Lincoln C. Bateson

S. Bruce Black

Norman L. Cahners

Richard P. Chapman

Edward Dana

William P. Ellison

Ernest Henderson

Stephen P. Mugar

Joseph G. Riesman

Dwight P. Robinson, Jr.

Alvin C. Zises

## CLASS OF 1968

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George R. Brown

John L. Burns

William R. Driver, Jr.

Harold D. Hodgkinson

Robert L. Johnson

James A. Morton

Frank L. Richardson

Robert G. Stone

Philip H. Theopold

Robert H. Willis

## CLASS OF 1970

\*Carl S. Ell

Robert Erickson

Frank L. Farwell

Samuel A. Groves

George Hansen

Henry C. Jones

Harold A. Mock

Robert E. Slater

Farnham W. Smith

Russell B. Stearns

Chaplin Tyler

## EX OFFICIO

Asa S. Knowles, President of the University

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Samuel A. Groves, Vice Chairman

S. Bruce Black

Frank L. Richardson

George R. Brown

Dwight P. Robinson, Jr.

Louis W. Cabot

Robert E. Slater

Norman L. Cahners

Farnham W. Smith

William R. Driver, Jr.

Russell B. Stearns

Carl S. Ell

Earl P. Stevenson

Ernest Henderson

Robert G. Stone

Lawrence H. Martin

Alvin C. Zises

William M. Rand

## EX OFFICIO

Byron K. Elliott

Asa S. Knowles

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\*President Emeritus of the University

# **GENERAL UNIVERSITY COMMITTEES**

## **THE EXECUTIVE COUNCIL**

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William C. White, Vice Chairman  
Loring M. Thompson, Secretary

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Lincoln C. Bateson	Edward S. Parsons
Jack R. Bohlen	Kenneth G. Ryder
Arthur E. Fitzgerald	Roy L. Wooldridge

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Gilbert C. Garland	Ronald E. Scott
James E. Gilbert	Robert Sheehan
LeRoy C. Keagle	Arthur A. Vernon
Wilfred S. Lake	Charlotte E. Voss
Minnie L. Lynn	Roy L. Wooldridge
Gilbert G. MacDonald	

William C. White, ex officio

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Ralph S. Blanchard, Jr.	*Rudolph M. Morris
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Roger F. Brightbill	Paul M. Pratt
Russell E. Brillhart	*Gustav S. Rook
Marcello J. Carrabes	Morton Rubin
Robert A. Feer	*Kenneth G. Ryder
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*Arthur E. Fitzgerald	*Ronald E. Scott
Walter L. Fogg	G. Donald Shelby
Norbert L. Fullington	Ernest L. Spencer
Charles M. Goolsby	Robert D. Stuart
Charles F. Haley	*Loring M. Thompson
Lyman A. Keith	Ralph A. Troupe
George Khiralla	*Arthur A. Vernon
William F. King	Harold A. Walker
*Wilfred S. Lake	Karl H. Weiss
Frank F. Lee	Henry O. Werntz
*Minnie L. Lynn	Edward R. Willett
*Thomas E. McMahon	Alvin J. Yorra

## **PRESIDING OFFICER**

Asa S. Knowles  
or  
Arthur E. Fitzgerald

\*Appointed by the President

## THE UNIVERSITY CABINET

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Dean S. Ammer	George M. Lane
Sidney F. Austin	George B. Le Beau
John S. Bailey	Donald W. Lovejoy
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Richard W. Bishop	Alan A. Mackey
Jack R. Bohlen	Richard D. MacPherson
Alvah K. Borman	George A. Mallion
Philip C. Boyd	Reuben J. Margolin
Bernard J. Brent	Frank E. Marsh, Jr.
Russell E. Brillhart	John P. McCarron
Richard I. Carter	Daniel McCarthy
Thomas J. Cavanagh	Thomas E. McMahon
Ronald W. Clifford	Edmund J. McTernan
Geoffrey Crofts	Roland H. Moody
Otis F. Cushman	Timothy F. Moran
Edmund L. Deltano	Rudolph M. Morris
Ray C. Dethy	Edmund J. Mullen
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Edith E. Emery	Philip W. Pendleton
Martin W. Essigmann	Eugene M. Reppucci, Jr.
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Arthur E. Fitzgerald	William E. Roberts
Walter H. Floyd	Edward W. Robinson
Herbert W. Gallagher	Gustav S. Rook
Gilbert C. Garland	Norman Rosenblatt
James E. Gilbert	Ronald E. Scott
Joseph M. Golemme	Robert Sheehan
Hall H. Graves	Richard E. Sprague
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E. Forest Hallet	Donald J. Taylor
George W. Hankinson	Loring M. Thompson
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Nelson R. Hill	Frank E. Truesdale
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Francis L. Hurwitz	Arthur A. Vernon
Robert J. Kates	Charlotte E. Voss
Israel Katz	Louis Vrettos
LeRoy C. Keagle	Janice Walker
Walter E. Kearney	William Wallace
Christopher F. Kennedy	John B. Whitla
Charles E. Kitchen	Roy L. Wooldridge

## EX OFFICIO

Asa S. Knowles

William C. White

# **ADMINISTRATIVE ORGANIZATION**

## **OFFICERS OF THE UNIVERSITY**

Asa S. Knowles, A.B., A.M., LL.D., Litt.D., Sc.D.	President
Carl S. Ell, A.B., M.S., Sc.D., L.H.D., LL.D., D.S.Ed.	President Emeritus
William C. White, B.S., Ed.M., Eng.D.	Executive Vice President
Lincoln C. Bateson, B.B.A., M.B.A.	Vice President and Director of Finance

## **OFFICERS OF GENERAL ADMINISTRATION**

John S. Bailey, B.S., M.B.A.	Dean of University Relations and Assistant to the President
Jack R. Bohlen, B.B.A.	Director of Development
Arthur E. Fitzgerald, E.E., S.M., Sc.D.	Dean of Faculty
Gilbert G. MacDonald, B.I.E., Ed.M.	Dean of Students
Edward S. Parsons, B.S., Ed.M.	Business Manager
Kenneth G. Ryder, A.B., M.A.	Vice President and Dean of University Administration
Loring M. Thompson, B.S., M.S., M.A., Ph.D.	Dean of University Planning
Roy L. Wooldridge, B.S., Ed.M.	Vice President and Dean of Co-operative Education

## **OFFICERS OF GENERAL ACADEMIC ADMINISTRATION**

John S. Bailey, B.S., M.B.A.	Acting Dean of University College
Geoffrey Crofts, B.Comm., F.S.A.	Dean and Director of the Graduate School of Actuarial Science
Martin W. Essigmann, S.B., M.S.,	Dean of Research
Albert E. Everett, B.S., M.B.A., D.C.S.	Dean of Continuing Education
Gilbert C. Garland, B.S., Ed.M., Ed.D.	Dean of Admissions
James E. Gilbert, B.S., M.A., Sc.D.	Director of the Office of Educational Resources
Carlo E. Gubellini, B.S., M.B.A.	Acting Dean of Business Administration
Charles W. Havice, A.B., M.A., S.T.B., Ph.D., D.D.	Dean of Chapel
LeRoy C. Keagle, B.S., Ph.D.	Dean of Pharmacy
Wilfred S. Lake, A.B., M.A., Ph.D.	Dean of Liberal Arts
Minnie L. Lynn, A.B., M.S., Ph.D	Dean of Boston-Bouvé College
Frank E. Marsh, Jr., A.B., M.Ed, D.Ed.	Dean of Education
Roland H. Moody, A.B., B.L.S.	Director of the University Library
Rudolph M. Morris, B.S., Ed.M.	University Registrar
Gustav S. Rook, B.S., Ed.M.	Dean of Lincoln College
Ronald E. Scott, B.S., M.A., Sc.D.	Dean of Engineering
Robert Sheehan, A.B., M.A.	Acting Dean of Criminal Justice
Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Charlotte E. Voss, B.S., M.S., Ed.D.	Dean of Nursing
Louis Vrettos, B.S., M.A., Ed.D.	Dean of Instruction and Director of the Suburban Campus

# *Aims and Scope of the University*

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston Bouvé College (1964), and the College of Criminal Justice (1967). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-campus locations near Boston.

The following is a brief outline of the aims and scope of the University's programs.

## UNDERGRADUATE COLLEGES

### BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study — Physical Education, Recreation, and Physical Therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Co-operative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

### COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

### COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

**COLLEGE OF ENGINEERING**

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

**COLLEGE OF LIBERAL ARTS**

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Co-operative Plan.

**LINCOLN COLLEGE**

Lincoln College offers technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also offers science technology and paramedical technology programs leading to the Associate in Science degree.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet the special needs of part-time students.

**COLLEGE OF NURSING**

The College of Nursing offers two separate and distinct programs of study, both organized on the Co-operative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable co-operative work opportunities during the upper-class years of these programs.

**COLLEGE OF PHARMACY**

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

## UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement and Security, and Health Care Administration, leading to the Associate in Science and Bachelor of Science degrees. Special-program certificates may also be earned, and workshops and seminars are offered for degree credit.

University College does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students who may be employed full-time or enrolled full-time in professional schools affiliated with Northeastern University. In co-operation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

University College and Lincoln College offer a joint program in Medical Technology conducted in affiliation with a number of hospital schools of medical technology approved by the American Medical Association. Students receive a Bachelor of Science degree from University College and they may write the examination for certification as a registered medical technologist (ASCP).

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

## GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

### ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

### ARTS AND SCIENCES

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, and Psychology.

### BUSINESS ADMINISTRATION

Master of Business Administration.

### EDUCATION

Master of Education.

### ENGINEERING

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and

master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

### **PHARMACEUTICAL SCIENCES**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

### **PROFESSIONAL ACCOUNTING**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

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Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

### **PROGRAMS FOR ADULT WOMEN**

These programs were developed to meet the needs of women with family or other obligations who wish to engage in part-time study during the day. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered. Men may enroll in most courses.

### **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working co-operatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## AFFILIATED PROGRAMS

### FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

### FOR MEDICAL TECHNOLOGISTS

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

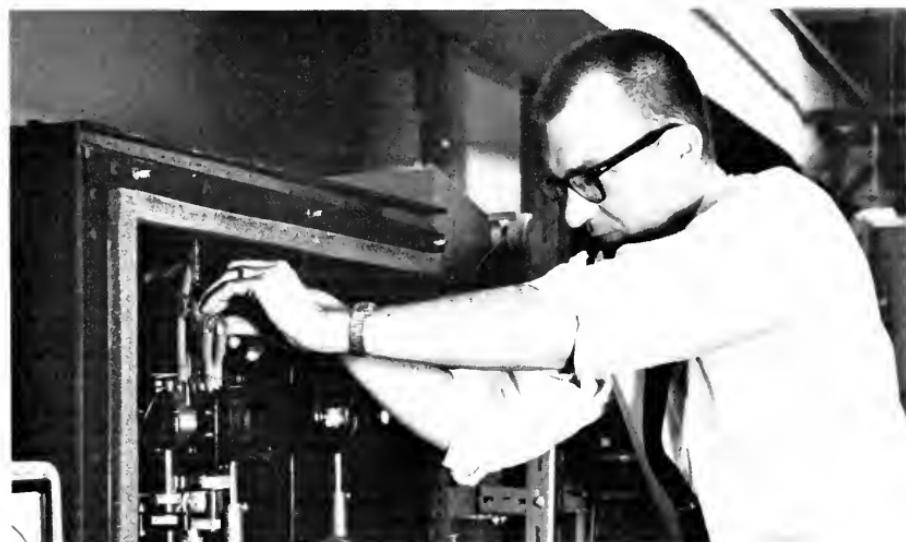
### FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

## RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



# *Buildings and Facilities*

Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South Stations. To reach the University from the North Station, board an MBTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

## **HUNTINGTON AVENUE CAMPUS**

The principal educational buildings of Northeastern University are located on Huntington Avenue on 16 acres of a 47-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 4.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to nine new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The newer buildings are interconnected by means of tunnels.

In addition to classrooms and instructional offices, the principal buildings and facilities are:

**Botolph Building.** Civil Engineering Laboratories.

**Cabot Physical Education Center.** Facilities for physical education and athletics; gymnasium; cage; rifle range.

**Churchill Hall.** Graduate Division; Physics Laboratories; faculty and staff cafeteria.

**Dodge Library.** Library; Center for Programmed Instruction; Engineering drawing rooms; Language Laboratory.

**EII Student Center.** Student activities; chapel; auditorium; student cafeteria; bookstore; student lounges and meeting rooms.

**102 The Fenway.** Center for Reading Improvement; Stearns Center for Research; gymnasium.

**Forsyth Building.** Laboratories for Industrial Engineering, Mechanical Engineering, and Allied Medical Sciences; planetarium; University Infirmary and Health Services.

**Greenleaf Building.** ROTC headquarters; research facilities.

**Hayden Hall.** Lincoln College; University College; Colleges of Business Administration, Education, Engineering, and Liberal Arts; Electrical Engineering Laboratories.

**Mugar Life Sciences Building.** College of Pharmacy; laboratories for Biology, Chemical Engineering, and Psychology.

**Research Building.** Research facilities for Electrical Engineering and Physics.

**Richards Hall.** Administrative offices; laboratories for Chemistry and Mechanical Engineering; bookstore.

**Robinson Hall.** Boston-Bouvé College; College of Nursing; laboratories for Biology and Physical Therapy; radio and television facilities.

**United Realty Building.** Research facilities for Mechanical Engineering, Biology, Psychology, and Chemistry; Institute for Rehabilitation.

### SUBURBAN CAMPUS AT BURLINGTON

In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

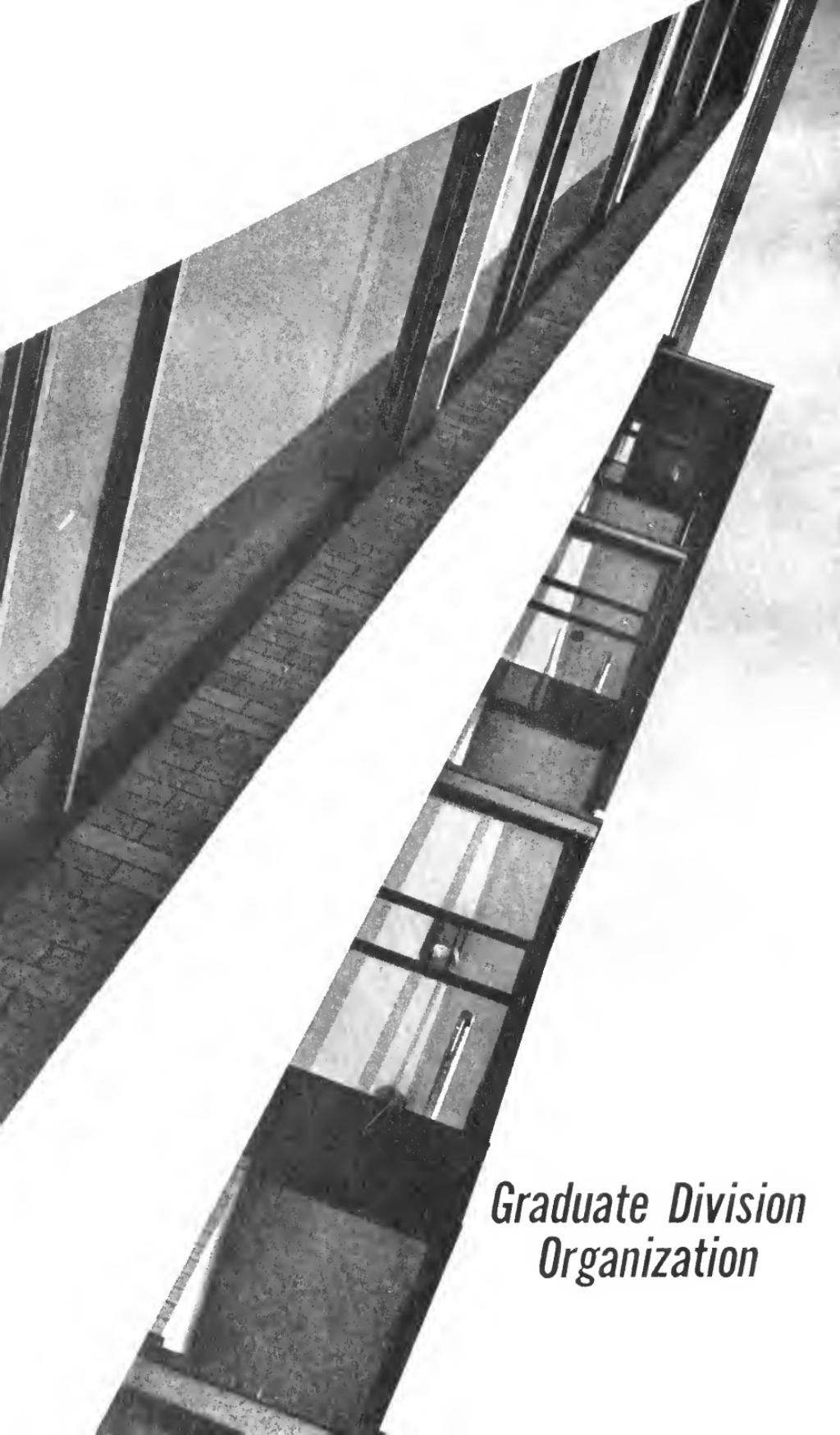
In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-arts programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

### HENDERSON HOUSE

At Henderson House in Weston, Massachusetts, Northeastern University operates one of the nation's finest off-campus centers for continuing education. Adults enroll in short-term courses, seminars, and special institutes at this conference center, located 12 miles from the main campus on Huntington Avenue.

### WARREN CENTER

A 70-acre tract in Ashland, including a small lake, is being developed for use as a laboratory for instruction in physical education and recreation.



*Graduate Division  
Organization*

## Graduate Schools and Degree Programs

### GRADUATE SCHOOL OF ACTUARIAL SCIENCE

MASTER OF SCIENCE IN ACTUARIAL SCIENCE

### GRADUATE SCHOOL OF ARTS AND SCIENCES

MASTER OF ARTS DEGREES

in the fields of

ECONOMICS, ENGLISH, HISTORY, POLITICAL SCIENCE,  
PSYCHOLOGY, and SOCIOLOGY-ANTHROPOLOGY

MASTER OF SCIENCE DEGREES

in the fields of

BIOLOGY, CHEMISTRY, HEALTH SCIENCES,  
MATHEMATICS, and PHYSICS

DOCTOR OF PHILOSOPHY DEGREES

in the fields of

BIOLOGY, CHEMISTRY, MATHEMATICS, PHYSICS, AND PSYCHOLOGY

### GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

MASTER OF BUSINESS ADMINISTRATION

### GRADUATE SCHOOL OF EDUCATION

MASTER OF EDUCATION

### GRADUATE SCHOOL OF ENGINEERING

MASTER OF SCIENCE DEGREES

in the fields of

CHEMICAL, CIVIL, ELECTRICAL, INDUSTRIAL,  
and MECHANICAL ENGINEERING, and  
ENGINEERING MANAGEMENT

DOCTOR OF PHILOSOPHY DEGREES

in the fields of

CHEMICAL, ELECTRICAL, and MECHANICAL ENGINEERING

### GRADUATE SCHOOL OF PHARMACEUTICAL SCIENCES

MASTER OF SCIENCE IN HOSPITAL PHARMACY

MASTER OF SCIENCE IN INDUSTRIAL PHARMACY

MASTER OF SCIENCE IN MEDICINAL CHEMISTRY

MASTER OF SCIENCE IN PHARMACOLOGY

### GRADUATE SCHOOL OF PROFESSIONAL ACCOUNTING

MASTER OF SCIENCE IN ACCOUNTING

## GRADUATE DIVISION

### GENERAL ADMINISTRATION

Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Janice Walker, A.B.	Registrar of the Graduate Division
W. Dennis Stires, B.S.	Administrative Assistant in the Graduate Division
Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M.	Administrative Assistant in the Graduate Division

### DIRECTORS OF THE GRADUATE SCHOOLS

Bernard J. Brent, B.S., M.S., Ph.D.	Graduate School of Pharmaceutical Sciences
Geoffrey Crofts, B.Comm., F.S.A.	Graduate School of Actuarial Science
Ray C. Dethy, B.S., M.A., Ph.D.	Graduate School of Education
Joseph M. Golemme, B.S., M.A.	Graduate School of Professional Accounting
George W. Hankinson, A.B., S.B., M.S.	Graduate School of Engineering
Daniel J. McCarthy, A.B., M.B.A., D.B.A.	Graduate School of Business Administration
Arthur A. Vernon, B.S., M.S., Ph.D.	Graduate School of Arts and Sciences

### UNIVERSITY GRADUATE COMMITTEE

**1966-67**

The responsibility of the committee is the determination of broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the committee.

#### Administrative Members

Arthur A. Vernon, Chairman	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, Secretary	Registrar of the Graduate Division
Bernard J. Brent	Professor of Medicinal Chemistry and Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts	Dean of the Graduate School of Actuarial Science
Ray C. Dethy	Assistant Dean of Education and Director of the Graduate School of Education
Arthur E. Fitzgerald	Dean of the Faculty
Joseph M. Golemme	Director of the Graduate School of Professional Accounting
Carlo E. Gubellini	Acting Dean of Business Administration

George W. Hankinson	Assistant Dean of Engineering and Director of the Graduate School of Engineering
LeRoy C. Keagle	Dean of Pharmacy
Wilfred S. Lake	Dean of Liberal Arts
Frank E. Marsh, Jr.	Dean of Education
Daniel J. McCarthy	Associate Dean of Business Administration and Director of the Graduate School of Business Administration
Kenneth G. Ryder	Dean of Administration
Ronald E. Scott	Dean of Engineering

**Elected Faculty Members****Terms Expire September, 1967**

Anker V. Andersen	Associate Professor of Accounting
David R. Cook	Associate Professor of Education
Robert J. Ferullo	Associate Professor of Special Education
Bernard M. Goodwin	Associate Professor of Chemical Engineering
John F. Reinhard	Professor of Pharmacology and Chairman of the Department
Nathan W. Riser	Professor of Biology and Director of the Marine Science Institute
Anghel N. Rugina	Professor of Economics and Finance
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
Albert H. Soloway	Associate Professor of Medicinal Chemistry
Ernest L. Spencer	Professor of Civil Engineering and Chairman of the Department

**Terms Expire September, 1968**

Wendell R. Brown	Associate Professor of Social Science Education
John F. Dunn	Professor of Mechanical Engineering
George M. Krause	Professor of Pharmacy
Robert W. Mullins	Associate Professor of Management
Robert J. Minichiello	Associate Professor of Marketing
Harold R. Raemer	Professor of Electrical Engineering and Chairman of the Department
Raymond H. Robinson	Professor of History and Chairman of the Department
George B. Rochfort, Jr.	Associate Professor of Education
Elliot Spector	Professor of Pharmacology
A. Bertrand Warren	Professor of Psychology and Chairman of the Department



# *General Graduate Division Regulations*

## **REGISTRATION**

Students must register in the Graduate Division Office at the times specified by the Graduate School calendar.

## **PROGRAM CLASSIFICATIONS**

Students who have registered for a degree program in the Graduate Division are given a program classification in one of the curricula listed in the catalog. Students who are not pursuing a specific degree program are entered upon the Graduate Division records as special.

## **RESIDENCE**

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

## **PROGRAMS OF STUDY**

At the time of his first registration, each full-time student must develop, with the assistance of his faculty adviser, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty adviser.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school concerned.

## GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

A. Excellent

This grade is given to those students whose performance in the course has been of very high graduate caliber.

B. Satisfactory

This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.

C. Fair

This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.

F. Failure

This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.

S. Satisfactory, without quality designation. This designation is used for thesis and seminar work.

W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within four weeks after the quarter ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within one week following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

## WITHDRAWALS

Students who wish to withdraw from a course after the start of the quarter must file an official withdrawal form in the Graduate Division Office. Any student who is absent for three class periods in succession without excuse will be dropped from the class.

The University provides all instruction and accommodations on an academic quarter basis; therefore, no refunds are granted except in cases where students are compelled to withdraw because of personal illness or other reasons beyond their control. In no case are refunds made after a student has attended the fifth session of a class. Questions regarding refunds should be discussed with the Bursar's Office.

## **CLASS HOURS AND CREDITS**

All credits are entered as quarter hours. A quarter hour is defined as the equivalent of one hour in class and two hours of outside preparation for twelve weeks. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the sessions.

## **INTERVIEW AND REGISTRATION DATES, OFFICE HOURS, AND CLASS SCHEDULES**

For dates of the interview and registration periods and office hours, consult the calendar pages. Circulars listing the times at which courses are given are issued at the beginning of the academic year. Copies of these circulars may be obtained from the office of the Graduate Division, Northeastern University, Boston, Massachusetts 02115, or by calling 262-1100.

## **THE MASTER'S DEGREE**

### **ADMISSION**

Specific requirements for each department will be found in the appropriate paragraph under each departmental heading. The necessary material for admission for full-time graduate study must be filed by March 15, unless other filing dates are indicated by the respective graduate schools. Applications for all fields except for those in the Graduate Schools of Actuarial Science, Pharmaceutical Sciences, and Professional Accounting should be made directly to the Graduate Division Office.

For admission to any part-time program, a personal interview with the director of the appropriate graduate school or the head of a department is required. Transcripts of the applicant's prior college training must be presented at that time. If this is not possible, such material must be filed within six weeks after registration or the student will be asked to withdraw.

### **ACADEMIC CLASSIFICATIONS**

After review of an applicant's transcript of undergraduate work, those students who are admitted are given an academic classification as regular or provisional. Those who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular. Those who have an undergraduate record which is not acceptable for regular classification are classified as provisional. Provisional students must obtain a B average in the first 16 quarter hours of credit work for which they register in order to continue in the Graduate Division. Students whose records are not satisfactory may be dropped prior to the completion of this amount of work. When provisional students obtain a B average in the first 16 quarter hours of credit work, they will be classified as regular students. The Graduate Division requirements apply to both classified and special students.

## **GENERAL REQUIREMENTS**

A candidate for the master's degree must complete satisfactorily an approved program conforming to the requirements of the department or graduate school in which he is registered.

The requirements for the master's degree are a minimum of 40 quarter hours of correlated work of graduate caliber, together with such other study as may be required by the department or graduate school concerned. Department chairmen and the directors of the graduate schools are available for counsel on the selection of electives.

## **ACADEMIC REQUIREMENTS**

In order to qualify for the master's degree, an average no lower than B must be obtained in the necessary quarter hour credits required for the degree. If a grade of F is obtained in a required course, this course must be repeated with a passing grade. If a grade of C is obtained in a required course, this course may be repeated once only. If a grade of F is obtained in an elective course, this course may be either repeated with a passing grade, or another elective course may be substituted for it. In order to satisfy the academic requirements for the degree, three extra courses will be allowed for students in all graduate schools except the Graduate School of Education, in which two extra courses will be allowed.

## **COMPREHENSIVE EXAMINATION**

At the discretion of the department, a final written or oral comprehensive examination may be required. No candidate may present himself for the final comprehensive examination without the permission of his faculty adviser. Such examinations must be taken at least two weeks before the commencement at which he expects to receive his degree.

## **THESIS**

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material. The thesis should show evidence that the student has a thorough acquaintance with the literature of a limited field and must meet the approval of the department or graduate school concerned.

Instruction concerning the details of preparation of the thesis may be obtained from the Graduate Division Office.

## **FOREIGN LANGUAGE REQUIREMENT**

Some departments require an examination to show evidence of ability to read one or more foreign languages. This reading knowledge is established by an examination arranged by the department concerned.



### TRANSFER CREDITS

After a student has been accepted for graduate study toward the master's degree he may submit a request for transfer credit. A maximum of 12 quarter hours of graduate credit may be accepted toward a master's degree if such work is approved by the director of the graduate school concerned or the Departmental Graduate Study Committee. Transfer credit will be considered only if the work is consonant with the objectives of the graduate program and if the grades in the courses are A or B. No grades on transfer credits may be used for the purpose of obtaining the academic average necessary for completion of the degree requirements.

### TIME LIMITATIONS

Course credits earned in the program of graduate study are valid for a maximum period of eight years. This time limitation is likewise applicable to any accepted transfer credits.

# *Tuition and Fees*

## **TUITION**

### **CO-OPERATIVE PROGRAMS**

Graduate School of Actuarial Science	\$425 per quarter
Graduate School of Arts and Sciences	\$400 per quarter
Graduate School of Engineering	\$525 per quarter
Graduate School of Pharmaceutical Sciences	\$525 per quarter
Graduate School of Professional Accounting	\$500 per quarter

### **FULL-TIME DOCTORAL PROGRAMS**

Graduate School of Arts and Sciences	\$500 per quarter
Graduate School of Engineering	\$525 per quarter

### **OTHER GRADUATE PROGRAMS**

Graduate School of Arts and Sciences	
Courses on Huntington Avenue Campus	\$31 per quarter hour credit
Courses on Burlington Campus	\$35 per quarter hour credit
Graduate School of Business Administration	
Courses on Huntington Avenue Campus	\$31 per quarter hour credit
Courses on Burlington Campus	\$35 per quarter hour credit
Graduate School of Education	
Courses on Huntington Avenue Campus	\$25 per quarter hour credit
Courses on Burlington Campus	\$25 per quarter hour credit
Guidance Practicum	\$100
Student Teaching	\$200
Graduate School of Engineering	
Courses on Huntington Avenue Campus	\$31 per quarter hour credit
Courses on Burlington Campus	\$35 per quarter hour credit

**FEES**

<b>REGISTRATION FEE</b>	\$10.00
Payable at time of first registration in all graduate schools.	
<b>LATE PAYMENT FEE</b>	\$ 5.00
For failure to pay tuition on due date.	
<b>MAKE-UP FEE</b>	\$ 5.00
<b>MEDICAL INSURANCE FEE</b>	\$18.00
For full-time students.	

**STUDENT CENTER CHARGES**

Graduate School of Actuarial Science	
Co-operative Students	\$10.00 per ten-week term of registration
Graduate School of Arts and Sciences	
Co-operative Students	\$12.50 per quarter of registration
Other Full-Time Students	\$12.50 per quarter of registration
Teaching and Research	
Fellows	\$ 6.25 per quarter of registration
Part-Time Students	
Registered on the Huntington Avenue Campus	\$ 0.75 per quarter of registration
Graduate School of Business Administration	
Full-Time Students	\$12.50 per quarter of registration
Teaching and Research	
Fellows	\$ 6.25 per quarter of registration
Part-Time Students	
Registered on the Huntington Avenue Campus	\$ 0.75 per quarter of registration
Graduate School of Education	
Full-Time Students	\$12.50 per quarter of registration
Part-Time Students	
Registered on the Huntington Avenue Campus	\$ 0.75 per quarter of registration
Graduate School of Engineering	
Co-operative Students	\$12.50 per quarter of registration
Other Full-Time Students	\$12.50 per quarter of registration
Teaching and Research	
Fellows	\$ 6.25 per quarter of registration
Graduate Co-operative	
Teaching Assistants	\$ 6.25 per quarter of registration
Graduate Co-operative	
Research Assistants	\$ 6.25 per quarter of registration

Part-Time Students Registered on the Huntington Avenue Campus	\$ 0.75 per quarter of registration
Graduate School of Pharmaceutical Sciences Co-operative Students	\$12.50 per quarter of registration
Graduate School of Professional Accounting Co-operative Students	\$12.50 per quarter of registration
<b>GRADUATION FEE</b>	<b>\$25.00</b>
Payable by all students at time of award of degree.	

### PAYMENTS

Tuition statements will be mailed to the students by the Student Accounts Office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

## FINANCIAL AID

Northeastern University has available fellowships and assistantships for students who are engaged in graduate work. The Graduate Division will send candidates the proper application blanks upon request.

### TEACHING ASSISTANTSHIPS

Teaching assistantships are available in most of the departments giving graduate work. Holders of such assistantships carry a half-time academic load and devote half time to academic assistance in the departments. The assistantship grant includes a stipend and remission of tuition.

### TUITION FELLOWSHIPS

Some departments have available tuition fellowships which cover six to nine quarter hours of graduate work per quarter. In return, students will be required to assist in the academic work of the department. These fellowships are normally given to students who are in the first year of graduate work.

### RESEARCH FELLOWSHIPS

Research fellowships are available in some departments giving graduate work. Holders of such fellowships carry a half-time academic load and devote half time to academic assistance in the departments. The fellowship grant includes a stipend and remission of tuition.

## DOCTORAL RESEARCH FELLOWSHIPS

In the departments which give work leading to the Ph.D. degree, research fellowships are available for students who have established candidacy for the Ph.D. degree. These fellowships carry remission of tuition, and the stipend is higher than that for the research fellowships.

## GRADUATE CO-OPERATIVE TEACHING ASSISTANTSHIPS

Some engineering departments have graduate co-operative teaching assistantships available for students for the master's degree on the Co-operative Plan. Holders of these assistantships alternate periods of academic work with periods of assistance in the department according to the co-operative calendar. Remission of tuition is given in addition to the compensation for the assistantship.

## GRADUATE CO-OPERATIVE RESEARCH FELLOWSHIPS

Some engineering departments have graduate co-operative research fellowships available for students studying for the master's degree on the Co-operative Plan. Holders of such fellowships alternate full-time research work with academic work according to the co-operative calendar. Remission of tuition is given in addition to the compensation for the fellowship.

## APPOINTMENTS

Appointments to fellowships and assistantships are ordinarily announced by April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed.

## FULL-TIME DUTIES

Graduate students who hold teaching assistantships and research fellowships, graduate co-operative teaching assistantships, or graduate co-operative research fellowships are expected to devote full-time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty adviser and the Dean of the Graduate Division.

## NATIONAL DEFENSE STUDENT LOAN PROGRAM

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one half the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$2,500. The total loans made to a student for all years, including any loans made to him as an undergraduate, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date the borrower ceases to carry, at an institution of higher education, at least one half the normal full-time academic workload as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, the cancellation rate is 15 per cent for each complete year of service; and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and appropriate application forms are available through the Graduate Division Office or from the Office of Financial Aid. The application deadline is September 1 for full-time students or one month prior to the start of the quarter for which aid is requested in the case of half-time students.





GRADUATE SCHOOL



# *Degree Programs of the Graduate School of Education*

## **Master of Education**

### **PROFESSIONAL SPECIALIZATIONS IN:**

Educational Administration  
Educational Research Technology  
Elementary School Counseling  
Elementary Mathematics  
Graphic Science  
Higher Education Counseling  
Liberal Arts Emphasis  
Reading  
Secondary School Counseling  
Speech Audiology and Pathology  
Secondary Mathematics Education  
Teaching the Emotionally Disturbed Child  
Vocational Rehabilitation Administration

### **INITIAL TEACHER CERTIFICATION PROGRAMS IN:**

Elementary Education  
Secondary Education  
    English  
    Mathematics  
    Modern Languages  
    Science  
    Social Studies

## **ACADEMIC CALENDAR 1967-68**

## **Summer Session 1967**

Registration Period for Former Students	Monday-Friday	May 29-June 9
*Interview and Registration Period for New Students	Monday-Friday	May 29-June 9
Classes Begin	Monday	June 26
Independence Day, No Classes	Tuesday	July 4
Classes End	Tuesday	August 1
Examination Period	Wednesday-Saturday	August 2-5

Fall Quarter 1967-68

<b>Preregistration Period for Former Students and New Full-Time Students Only</b>	Monday-Friday 10 a.m. to 3 p.m.	May 15-May 19
<b>Regular Registration Period for Former Students</b>	Monday-Friday	July 24-28
<b>*Interview and Registration Period for New Students</b>	Monday-Friday	Aug. 21-Sept. 8
<b>Classes Begin</b>	Monday	September 18
<b>Columbus Day, No Classes</b>	Thursday	October 12
<b>Thanksgiving, No Classes</b>	Thursday-Friday	November 23-24
<b>Examination Period</b>	Monday-Friday	Nov. 27-Dec. 1

## Winter Quarter 1967-68

Change of Registration for Former Students	Monday-Friday	Nov. 27-Dec. 1
*Interview and Registration Period for New Students	Monday-Friday	Nov. 27-Dec. 1
Classes Begin	Monday	December 11
Christmas Vacation, No Classes	Saturday-Monday	Dec. 23-Jan. 1
Washington's Birthday, No Classes	Thursday	February 22
Examination Period	Monday-Friday	March 4-8

Spring Quarter 1967-68

Change of Registration for Former Students	Monday-Friday	Feb. 26-Mar. 1
Classes Begin	Monday	March 18
Patriots' Day No Classes	Friday	April 19
Final Grades for June Graduates		
Taking Third-Quarter Courses	Friday	May 24
Memorial Day, No Classes	Thursday	May 30
Examination Period	Monday-Friday	June 3-7

1968-69 Preregistration Period for Former Students and New Full-Time Students  
only Monday-Friday May 13-17, 1968

\*Appointments for interviews with new students must be made at least four days before the date of the interview.

# **MASTER OF EDUCATION DEGREE**

## **Admission**

To be enrolled for graduate work in education, applicants must have earned a bachelor's degree from an accredited institution and complete the admission procedures as outlined below:

Applicants who wish to be admitted for full-time study for any degree program must have all of the following material filed according to the following schedule:

For Summer quarter — April 1

For Fall quarter — April 1

For Spring quarter — November 1

No applicants for full-time study will be initially accepted for the Winter quarter.

The following material must be filed with the Graduate School of Education at the same time as the application and prior to the dates stated above:

1. An official transcript of all prior college work.
2. Reference forms.
  - a. For experienced teachers: a form to be completed by the present or most recent supervisor.
  - b. For teachers without experience: three general reference forms must be completed. (Applicants with teaching experience need not file these forms.)
3. Results from the Miller Analogies Test. This test may be taken either at the University's Counseling and Testing Center or at any other location where it is administered. A fee of five dollars is payable at the time of the test.
4. In addition, an interview is required with the Director of the Graduate School of Education or one of his designates. In some cases, an interview may be required with the Committee on Graduate Study in Education. This requirement may be waived for out-of-state students.

## **Programs of Study**

The curricula of the degree programs for the Master of Education degree are given on pages 49-64.

Programs are available for students with or without regular teaching certification. Those with certification may major in the following professional specializations: Educational Administration, Educational Research Technology, Elementary Counseling, Elementary Mathematics, Elementary Science, Graphic Science, Higher Education Counseling, Liberal Arts Emphasis, Reading, Secondary Counseling, Secondary Mathematics Education, Speech Pathology and Audiology, Teaching the Emotionally Disturbed Child, and Vocational Rehabilitation Administration.

Students without teacher certification must pursue a Master of Education degree program which includes supervised practice teaching. Certification requirements are satisfied as part of the Master of Education degree program in Elementary Education and the following subject areas at the secondary school level: English, Mathematics, Modern Languages, Science, and Social Studies.

## **Program Selection**

Before a student registers for the first time, his professional objectives must be determined, after which a program to achieve these objectives will be prepared. For this purpose, an interview is required with the Director of the Graduate School, or one of his designates.

After a student is classified, the Director will assign a faculty adviser in his major area of study. Any change in a student's program after initial development must first have the written approval of the adviser.

Persons not planning to pursue a degree program may, with the approval of the Director, register for courses after submitting evidence of having a bachelor's degree.

## **Part-Time Study**

All of the courses of study are available for those who wish to obtain a Master of Education degree through part-time study offered during the late afternoon and evening hours.

All applicants for part-time study are registered by the Director of the Graduate School of Education or one of his designates, by appointment at the times stated in the catalog. Appointments must be made at least one week before the time of a requested interview.

Applicants who wish to register for any degree program should present a completed application and a transcript of all prior work at the time of the interview.

### **Special-Student Status**

A person who wishes to take courses but does not plan to pursue a degree program may, with the approval of the Director, register as a special student after submitting evidence of having a bachelor's degree and completing an application.

### **Suburban Campus Programs**

In addition to the regular afternoon and evening offerings, several graduate education programs are available to students at the Suburban Campus in Burlington, Mass. Application and registration materials or information about these or other programs of the Graduate School of Education are available either through writing or telephoning the Office of the Graduate School at the Huntington Avenue Campus.

One such program offers graduate courses during the morning hours, particularly attractive to housewives and others who wish to pursue initial teacher certification and the Master of Education degree.

A second program at the Burlington Campus offers all courses toward the Master of Education degree in the areas of Educational Administration, Guidance, Reading, Elementary School Science and Mathematics. This kind of program is termed a "package" program because the same groups of students remain together for the total degree sequence. Package programs are begun only during the Fall quarter and are offered only if a group of at least 25 students registers for each major area of specialization.

### **Courses**

The courses for the degree programs for the Master of Education degree are given on pages 66-85. The description of graduate courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward a degree. Many of the courses listed are of interest to teachers who may wish to take them to gain a special competence, but do not wish to complete a degree program.

### **Credit and Course Requirements**

In satisfying the requirement for a minimum of 42 quarter hours, a student's program must include at least 12 courses.



**COMMITTEE ON GRADUATE STUDY  
IN EDUCATION**

Director of the Graduate School  
of Education, Chairman Ray C. Dethy  
Dean of Education Frank E. Marsh  
Dean of the Graduate Division Arthur A. Vernon  
Also:  
No fewer than five senior members of the faculty of the College of  
Education who are appointed by the Director of the Graduate School  
with approval of the Dean of Education.

**FACULTY**

<b>Marvin S. Arffa</b>	<b>Lecturer in Education</b>
A.B., Syracuse University; M.S., Ed.D., University of Buffalo	
<b>Robert Bachelder</b>	<b>Lecturer in Education</b>
B.S.Ed., Lowell State College; M.A.Ed., Tufts University	
<b>Ronald E. Baptiste</b>	<b>Assistant Professor of Education</b>
A.B., Tufts University; Ed.M., Northeastern University	
<b>Evelyn W. Brehm</b>	<b>Lecturer in Education</b>
A.B., Otterbein College; M.S., University of Pennsylvania	
<b>Wendell R. Brown</b>	<b>Associate Professor of Education</b>
B.A., LL.B., Cornell University; D.S.S., Syracuse University	
<b>Nicholas J. Buffone</b>	<b>Assistant Professor of Education</b>
B.A., New York University; M.Ed., Ph.D., University of Oklahoma	
<b>Marjorie O. Burrill</b>	<b>Assistant Professor of Education</b>
B.S., Boston University; M.Ed., Harvard University	
<b>Robert S. Butters</b>	<b>Assistant Professor of Education</b>
A.B., American International College; M.Ed., Westfield State College	
<b>Malcolm J. Campbell</b>	<b>Lecturer in Education</b>
B.A., M.Ed., Northeastern University	

**Thomas H. Clark** **Assistant Professor of Education**  
B.A., Dartmouth College; M.A., Columbia University

**Simon L. Cohen** **Lecturer in Education**  
B.S., M.S.W., Boston University

**David R. Cook** **Associate Professor of Education**  
**Chairman, Department of Counselor Education**  
B.S.Ed., Boston University; M.S., Ed.D., Indiana University

**Gerald E. Cubelli** **Lecturer in Education**  
B.S., Marietta College; M.S., Columbia University

**Otis F. Cushman** **Assistant Dean of Engineering**  
B.S., M.S., University of New Hampshire

**Robert W. DeLancey** **Associate Professor of Education**  
B.Ed., Brockport State; A.M., University of Michigan; Ph.D.,  
Syracuse University

**Ray C. Dethy** **Assistant Dean of Education, Director,**  
**Graduate School of Education**  
B.Sc., M.A., Ph.D., Ohio State University

**E. Lawrence Durham** **Professor, Chairman,**  
**Department of Foundations of Education**  
A.B., M.A., Boston University

**Lionel P. Etscovitz** **Assistant Professor of Education**  
A.B., Brown University; Ed.M., Boston University

**Robert J. Ferullo** **Associate Professor of Special Education**  
B.S.B.A., Ed.M., Ed.D., Boston University

**J. E. Gilbert** **Associate Professor of Programmed Instruction**  
**Technology and Director of Office of Educational Resources**  
B.S., University of New Mexico; M.A., American University

**George J. Goldin** **Director of Rehabilitation Institute**  
B.S., University of Massachusetts; M.S., Boston University; Ph.D.,  
Brandeis University

**E. Vaughn Gulo** **Associate Professor of Education**  
A.B., Ed.D., Boston University; M.A., University of Texas

**Charles F. Haley** **Associate Professor of Education,**  
**Interim Chairman, Department of Instruction,**  
B.S., Bridgewater State Teachers College; M.Ed., Boston  
University

<b>Frances A. Harding</b>	<b>Lecturer in Education</b>
A.B., Harvard University	
<b>Ruth Harmon</b>	<b>Assistant Professor of Education</b>
LL.B., M.Ed., Boston University	
<b>Robert W. Hayes</b>	<b>Lecturer in Education</b>
B.A., Bates College; M.Ed., Ed.D., Boston University	
<b>Henry C. Heaney</b>	<b>Lecturer in Education</b>
B. Arch., McGill University	
<b>Simon Hoffman</b>	<b>Lecturer in Education</b>
B.A., Brooklyn College; M.A., Ed.D., Columbia University	
<b>Melvin Howards</b>	<b>Associate Professor of Education and Director of Center for Reading Improvement</b>
B.S., Drake University; M.A., Ph.D., Columbia University	
<b>Charles Karis</b>	<b>Assistant Professor of Psychology</b>
A.B., A.M., Ph.D., Boston University	
<b>Maurice Kaufman</b>	<b>Assistant Professor of Education</b>
B.S., M.S., City College of New York; Ph.D., New York University	
<b>Helen J. Kenney</b>	<b>Associate Professor of Education</b>
B.A., Emmanuel College; M.Ed., Boston College; Ed.D., Boston University	
<b>Alvin Kent</b>	<b>Lecturer in Education</b>
B.A., New School for Social Research	
<b>Frank W. Kerwin</b>	<b>Lecturer in Education</b>
B.B.A., M.C.S., Boston University	
<b>Violet A. Kugris</b>	<b>Lecturer in Education</b>
B.S., Pennsylvania State University; Ed.M., Ed.D., Harvard University	
<b>Robert S. Lang</b>	<b>Associate Professor of Graphic Science</b>
B.S., Northeastern University; Ed.M., Boston University	
<b>Mary J. Lee</b>	<b>Associate Professor of Education</b>
B.A., Boston University; M.Ed., Northeastern University	
<b>Donald S. Leeds</b>	<b>Assistant Professor of Education</b>
B.A., M.A., New York University	
<b>Carlton B. Lehmkuhl</b>	<b>Assistant Professor of Education</b>
B.S., M.S., Indiana University; Ph.D., University of Minnesota	

<b>Martin A. Linsky</b>	<b>Lecturer in Education</b>
B.A., Williams College; LL.B., Harvard Law School	
<b>Douglas F. MacDonald</b>	<b>Lecturer in Education</b>
B.S., Bridgewater State College, M.Ed., Ed.D., Boston University	
<b>Reuben J. Margolin</b>	<b>Professor and Chairman, Department of Rehabilitation and Special Education</b>
A.B., Northeastern University; M.A., Boston University; Ed.D., Columbia University	
<b>Frank E. Marsh</b>	<b>Dean of the College of Education</b>
A.B., Clark University; Ed.M., University of New Hampshire; Ed.D., Boston University	
<b>Robert C. McLean, Jr.</b>	<b>Associate Professor of Education</b>
A.B., M.S., University of California; Ed.D., University of Southern California	
<b>Harold A. Miner</b>	<b>Assistant Professor of Education</b>
B.S., University of Massachusetts; Ed.M., Boston University; Ed.D., Harvard University	
<b>Irene A. Nichols</b>	<b>Assistant Professor of Education</b>
B.S., Boston Teachers College; Ed.M., Harvard University	
<b>Maureen S. O'Donnell</b>	<b>Instructor in Education</b>
B.S., M.Ed., Pennsylvania State University	
<b>Simon S. Olshansky</b>	<b>Lecturer in Education</b>
B.S., M.A., Boston University	
<b>Arthur J. O'Shea</b>	<b>Lecturer in Education</b>
A.B., M.A., Weston College; M.Ed., Boston College	
<b>Phillip W. Pendleton</b>	<b>Director of Counseling and Testing</b>
B.A., University of Maine; M.A., Ph.D., Ohio State University	
<b>Guy A. Petralia</b>	<b>Assistant Professor of Education</b>
A.B., A.M., Boston University; Ed.M., Harvard University	
<b>Robert W. Read</b>	<b>Assistant Professor of Education</b>
A.B., Boston University; M.A., Stanford University	
<b>George B. Rochfort, Jr.</b>	<b>Associate Professor of Education</b>
B.S., M.Ed., D.Ed., Boston University	

<b>Charles L. Rose</b>	<b>Lecturer in Education</b>
B.A., Harvard University; M.A., University of Chicago	
<b>Nancy E. Rosoff</b>	<b>Instructor in Education</b>
B.S., M.S., Boston University	
<b>Joseph C. Sabbath</b>	<b>Lecturer in Education</b>
B.Sc., M.D., McGill University	
<b>Dorothy M. Singer</b>	<b>Lecturer in Education</b>
B.L.I., Emerson College; M.Ed., D.Ed., Boston University	
<b>Catherine M. Sobota</b>	<b>Assistant Professor in Education</b>
A.B., Ph.D., University of Pittsburgh	
<b>Alan B. Sostek</b>	<b>Associate Professor of Education</b>
A.B., M.A., Ph.D., Boston University	
<b>Joseph Spear</b>	<b>Lecturer in Education</b>
A.B., Harvard University; M.A., Boston University	
<b>Paul H. Tedesco</b>	<b>Assistant Professor of Education</b>
A.B., Harvard University; A.M., Boston University	
<b>Frank E. Truesdale</b>	<b>Assistant Dean of Lincoln College</b>
B.S., University of Massachusetts	
<b>Lucy T. Ulman</b>	<b>Lecturer in Education</b>
B.S., M.Ed., Boston University	
<b>Kenneth A. Weene</b>	<b>Lecturer in Education</b>
A.B., Princeton University; M.Ed., Columbia University	
<b>Michael E. Werle</b>	<b>Instructor in Education</b>
B.S.Ed., Ohio University; M.Ed., Northeastern University	
<b>Roland Will</b>	<b>Visiting Professor of Education</b>
A.B., Rio Grande College; M.A., Ph.D., Ohio State University	
<b>Albert C. Williamson</b>	<b>Lecturer in Education</b>
A.B., A.M., Boston College; Ed.M., State College at Bridgewater	
<b>Wesley G. Woll</b>	<b>Lecturer in Education</b>
B.S., Springfield College; M.D., Boston University	
<b>Alvin D. Zalinger</b>	<b>Lecturer in Education</b>
B.S., M.A., Boston University	

*Fields  
of  
Study*



## **PROGRAMS IN PROFESSIONAL SPECIALIZATIONS**

Applicants who possess a valid teaching certificate or who are eligible for such certificate at the time the program is begun, may be admitted to the study for the Master of Education degree and specialize in one of the following areas:

Educational Administration (page 50)

Educational Research Technology (page 50)

Elementary Mathematics (page 51)

Elementary School Counseling (page 51)

Elementary Science (page 52)

Graphic Science (page 52)

Higher Education Counseling (page 53)

(teaching certification **not** required)

Liberal Arts Emphasis (page 54)

Reading (page 54)

Secondary School Counseling (page 55)

Secondary Mathematics Education (page 55)

Speech Pathology and Audiology (pages 56-57)

Teaching the Emotionally Disturbed Child (page 58)

Vocational Rehabilitation Administration (pages 59-60)

All students must complete one of the programs as outlined in the following pages. In most cases, the sequence is designed to be very flexible. Any variations or changes must have the prior recommendation of the major adviser and approval of the Director of the Graduate School of Education.

## **Educational Administration**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Educational Administration Core (required of all majors)

- 52.800 Introduction to Educational Administration
- 52.801 Curriculum Development and Supervision
- 52.802 School Staff, Pupil Personnel Administration and School Law
- 52.803 Principles of Administrative Organization, School Finance, and School Business Management Practices

——— Four elective courses

Students specializing in Educational Administration may be required by their adviser to choose electives from among the following courses as they are pertinent to their specific administrative goals.

- 51.801 Curriculum of the American School
- 52.804 The School Principalship
- 52.805 Simulated Administrative Workshop
- 52.806 Field Study Practicum in School Administration (by invitation only)
- 52.807 Advanced Seminar on Educational Administration

## **Educational Research Technology**

For further information about this new program, please write or call: Director of the Graduate School of Education; Northeastern University; 360 Huntington Avenue; Boston, Massachusetts 02115; Telephone (617) 266-0635.

## **Elementary Mathematics**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Mathematics Core (required of all Mathematics majors)

- 51.810 Elementary Arithmetic Concepts for Teachers
- 51.811 Elementary Number Concepts for Teachers
- 51.812 Elementary Algebraic Concepts for Teachers
- 51.813 Elementary Geometric Concepts for Teachers
- 51.815 Seminar in Elementary Mathematics and Sciences

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Three Electives

## **Elementary School Counseling**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Guidance Core (required of all Elementary Counseling majors)

- 53.800 Foundations of Guidance
- 53.801 Tests and Test Procedures
- 53.802 Vocational Development and Occupational Information
- 53.803 Counseling I
- 53.805 Counseling Practicum (Elementary Level)
- 53.810 Counseling in the Elementary School
- 53.823 Measurement of Intelligence: Stanford-Binet Scales

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Elective

Students may be required to take 50.803, Child Psychology, without degree credit if their previous background is deemed insufficient.

To be admitted to 53.805, Counseling Practicum, the student must complete 53.803, Counseling I, and 53.804, Counseling II, with a grade of B or better and receive permission of the Chairman of the Department of Counselor Education.

### **Elementary Science**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Science Core (required of all Elementary Science majors)

- 51.830 Concepts of Earth Sciences for Elementary Teachers
- 51.831 Concepts of Biology for Elementary Teachers
- 51.832 Concepts of Physical Sciences for Elementary Teachers
- 51.833 Teaching of Elementary School Sciences
- 51.815 Seminar in Elementary Science and Mathematics

— Three Electives

### **Graphic Science**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Graphics Core (required of all Graphic Science majors)

- 51.901 Descriptive Geometry I
- 51.902 Descriptive Geometry II
- 51.903 Graphics, Geometry, and Mathematics
- 51.905 Machine Drawing and Design
- 51.906 Graphical Analyses
- 51.907 Electrical and Electronic Drawing
- 51.908 Architectural Drawing and Design
- Elective
- 51.904 Principles and Teaching of Technical Drawing
- 51.910 Principles of Computer Programming
- 51.999 Directed Study

## Higher Education Counseling

This program is designed for those students who plan to work at the college or junior college level, or for those students who will counsel in non-educational institutions such as the state employment service, Neighborhood Youth Corps, Youth Opportunity Centers, YMCA, and YWCA. College and junior college positions that a student might enter from this program include residence hall counselor, director of residence halls, director of student activities, and assistant dean of men or women. For some students in this program, 53.809 will not be required and may be waived by the adviser and an elective substituted. Teacher certification is **not** a prerequisite for this program.

### Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

### Guidance Core (required of all Higher Education Counseling majors)

- 53.800 Foundations of Guidance
- 53.801 Tests and Test Procedures
- 53.802 Vocational Development and Occupational Information
- 53.803 Counseling I
- 53.804 Counseling II
- 53.809 Student Personnel Work in Higher Education
- 53.805 Counseling Practicum (college level)  
— Elective

To be admitted to 53.805, Counseling Practicum, the student must complete 53.803, Counseling I, and 53.804, Counseling II, with a grade of B or better and receive permission of the Chairman of the Department of Counselor Education.

### **Liberal Arts Emphasis**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Liberal Arts Emphasis Core (required of all majors)

- 50.830 History of Educational Thought
- 50.831 History of Educational Thought
- Six Electives. All electives must be chosen from the offering of Arts and Sciences, Business Administration, or Engineering unless otherwise approved by the student's adviser. The student should confer with the Director in planning these courses.

### **Reading**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking

Reading Core (required of all Reading majors)

- 54.801 Teaching Reading and Language Skills, Elementary Level
- 54.802 Introduction to Remedial Reading: Elementary Level
  - or
- 54.803 Introduction to Remedial Reading: Secondary Level
- 54.804 Diagnosis and Correction of Reading Disability I
- 54.805 Diagnosis and Correction of Reading Disability II
- 54.806 Practicum in Reading
- 54.807 Research in Reading
- Three Electives

## **Secondary School Counseling**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Guidance Core (required of all Secondary Counseling majors)

- 53.800 Foundations of Guidance
- 53.801 Tests and Test Procedures
- 53.802 Vocational Development and Occupational Information
- 53.803 Counseling I
- 53.804 Counseling II
- 53.805 Counseling Practicum
- 53.806 Field Work Practicum
- \_\_\_\_\_ Elective

To be admitted to 53.805, Counseling Practicum, and 53.806, Field Work Practicum, the student must complete 53.803, Counseling I, and 53.804, Counseling II, with a grade of B or better and receive permission of the Chairman of the Department of Counselor Education.

## **Secondary Mathematics Education**

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Secondary Mathematics Core (required of all majors)

- 51.823 Concepts of Modern High School Mathematics I
- 51.829 Mathematics in General and Vocational Education
- \_\_\_\_\_ Six Electives. Students majoring in the secondary mathematics concentration are expected to elect six courses from the following electives or graduate courses in mathematics. The specific program will be developed by the adviser.
- 51.812 Elementary Algebraic Concepts for Teachers
- 51.813 Elementary Geometric Concepts for Teachers
- 51.824 Concepts of Modern High School Mathematics II
- 51.826 College Algebra for Teachers
- 51.827 Trigonometry and Analytic Geometry for Teachers
- 51.828 Introduction to Calculus for Teachers
- 51.910 Computer Programming

### **Speech Pathology and Audiology**

The program leading to the degree of Master of Education in either Speech Pathology or Audiology is designed to qualify candidates for membership in and certification by the American Speech and Hearing Association. Graduates of the program are also qualified for further graduate study, and for employment as speech pathologists or audiologists in clinics, hospitals, public schools, and rehabilitation centers.

This program assumes that students have completed an undergraduate program in speech and hearing. Those without such preparation will be required to complete additional courses beyond the 48 quarter hours normally required for the master's degree.

#### **Speech Pathology**

##### **Master of Education Core (required of all candidates)**

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

##### **Speech Pathology Core (required of all Speech majors)**

- 50.912 Differential Diagnosis in Speech Pathology
- 50.913 Clinical Externship
- 50.914 Clinical Audiometry I
- 50.916 Test Procedures in Speech and Language Pathology
- 50.991 Thesis

— Two Electives (may be in Speech Pathology or some related area such as Counseling, Guidance, Psychology, Reading, Rehabilitation, or Special Education; see also list of electives, p. 57)

## Audiology

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

Audiology Core (required of all Audiology majors)

- 50.914 Clinical Audiometry I
- 50.919 Clinical Audiometry II
- 50.915 Clinical Audiology II
- 50.917 Advanced Anatomy, Neurology and Physiology of Speech and Hearing
- 50.913 Clinical Externship
- 50.991 Thesis
- \_\_\_\_\_ Elective

Electives in Speech Pathology and Audiology

- 50.918 Pathologies of the Ear
- 50.902 Organization and Management of Public School Speech and Hearing Therapy Programs
- 50.911 Seminar: Stuttering
- 50.903 Seminar: Cerebral Palsy
- 50.904 Seminar: Aphasia and Related Neurological Disturbances
- 50.905 Seminar: Functional and Organic Disorders of Voice
- 50.906 Seminar: Language Disturbances in Children
- 50.922 Seminar: Functional and Organic Disorders of Speech
- 50.917 Advanced Anatomy, Neurology, and Physiology of Speech and Hearing
- 50.921 Seminar: Audiology
- 50.920 Physiological Acoustics

**Teaching the Emotionally Disturbed Child**

This program is designed for individuals who hold a certificate for teaching in regular classrooms and who wish to qualify as special class teachers of emotionally disturbed children. Students may be required to take 50.803, Child Psychology, without degree credit if they have not previously taken a similar course.

**Master of Education Core (required of all candidates)**

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education

**Teaching the Emotionally Disturbed Child Core (required of all majors)**

- 50.805 Personality and Social Structure
- 50.807 Abnormal Psychology
- 50.930 Etiology, Dynamics, and Treatment of Emotional Disturbance in Children
- 50.931 Special Class Methods with Emotionally Disturbed Children
- 53.801 Tests and Test Procedures
- 51.805 Student Teaching and Practicum Seminars
- Electives. (Students may also choose electives from selected courses from Remedial Reading and Speech Pathology and Audiology programs.)
  - 50.901 Psychology of Exceptional Children
  - 50.932 Group Dynamics
  - 50.933 Mental Health
  - 50.934 Case Conferences on Emotionally Disturbed Children
  - 50.935 Socio- and Psychodynamics of Family Life
  - 50.999 Directed Study in Special Education



Dr. Reuben J.  
Margolin  
Chairman of the  
Department of  
Rehabilitation  
and Special  
Education

### Vocational Rehabilitation Administration

Students majoring in Vocational Rehabilitation Administration should anticipate taking 14 credit courses for the degree under either of the following options:

#### Plan A

For students with considerable rehabilitation or administration experience, the program takes one calendar year from September through August and includes four academic quarters. During this time the student also completes his field work.

#### Plan B

For students with limited rehabilitation or administration experience, the program includes four academic quarters plus three full quarters spent in field work assignments. These quarters are arranged either to alternate with academic quarters or to be combined in any sequence from three to ten months. The degree program in this plan runs from September to June (21 months).

Candidates are eligible for stipends under either of the two plans for the duration of the plan.

Master of Education Core (required of all candidates)

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education
- \*50.816 Statistics

Rehabilitation Core (required of all Vocational Rehabilitation Administration majors)

- 50.950 Introduction to Rehabilitation
- 50.951 Principles of Medical Rehabilitation
- 50.952 Vocational Rehabilitation
- 50.954 Organization and Administrative Theory
- 50.953 Essentials of Supervision in Rehabilitation
- 50.955 Administration of a Rehabilitation Setting
- 50.957 Federal-State Relations in Rehabilitation
- \*50.959 Practicum in Rehabilitation Research
- \*50.960 Practicum in Rehabilitation Administration
- Electives. Students will be required by their advisers to choose electives from the following courses as they pertain to specific administrative goals.
- 50.932 Group Dynamics
- 50.956 Community Planning in Rehabilitation
- 50.958 Social Welfare and Rehabilitation
- 50.962 Administration of a Sheltered Workshop
- 50.964 Rehabilitation and the Law
- 50.965 Occupational Placement

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\*Required but does not carry degree credit.



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behavioral Research**

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618  
M

618  
M



## **PROGRAMS FOR INITIAL TEACHER CERTIFICATION**

### **Program of Studies**

Applicants who do not possess a valid teaching certificate are offered a program designed to prepare them for state certification and concurrently fulfill the requirements for a Master of Education degree. Initial certification programs are available for elementary and secondary teaching fields. No student will be permitted to do student teaching except as a part of the appropriate certification Master of Education degree program.

A student may register for one or two courses prior to his acceptance into a program. Before the end of the first semester of study, all students must complete the application form, take the Miller Analogies Test administered by the Northeastern University Counseling and Testing Center, and be approved by the Committee on Graduate Study in Education.

If preparation courses in general psychology, principles of teaching, child psychology or adolescent psychology have not been taken previously, applicants will be required to take such work in addition to degree requirements. Such courses carry graduate credit but may not be included in a degree program. The Director of the Graduate School in Education will determine when these requirements have been satisfied.

### **Student Teaching**

Applications for student teaching must be received by the Director of the Graduate School of Education no later than October 15. Student teaching in the graduate program is scheduled for the Spring quarter.

Acceptance in the student teaching program is contingent upon:

- An academic average of B or better in all courses pursued in the Graduate School of Education.
- The recommendation of the student's major adviser.

Ordinarily, student teaching will not be permitted until the following courses have been completed: 50.806, Psychology of Learning and Thinking; 51.801, Curriculum of the American School; 51.802, Evaluation and Measurement; the special method(s) course(s) and any preparation courses that are necessary.

Because of the unique demands of student teaching, participants may not enroll for additional courses concurrent with student teaching without the recommendation of the major adviser and the approval of the Director.

**Elementary Education**

Preparation Courses (if not taken previously): General Psychology, Principles of Teaching, and Child Psychology.

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education
- 54.801 Teaching Reading and Language Skills (special methods)
- 51.810 Elementary Arithmetic Concepts for Teachers (special methods)
- 51.834 Elementary Science Methods and Curriculum (special methods)
- One other special methods course, which may be the second course in any of the above sequences.
- 51.805 Student Teaching and Seminar — 8 Quarter Hours
- 51.801 Curriculum of American School
- 51.802 Measurement and Evaluation
- Three Electives

**Secondary Education**

Preparation Courses: General Psychology (if not taken previously), Principles of Teaching, and Adolescent Psychology.

- 50.801 Social Foundations of Education
- 50.802 Social Foundations of Education
- 50.806 Psychology of Learning and Thinking
- 50.815 Research Methods in Education
- Special Methods in the Major Subject Area — One Course (two courses for science)
- 50.805 Student Teaching and Seminar — 8 Quarter Hours
- 51.801 Curriculum of the American School
- 51.802 Measurement and Evaluation
- Three Electives



# **DESCRIPTION OF COURSES**

All courses carry four quarter hours' credit unless indicated otherwise. Please see the current brochure for Summer, Fall, Winter, and Spring quarter listings.

## **FOUNDATIONS OF EDUCATION**

### **50.801 Social Foundations of Education**

(Students with heavy undergraduate concentration in anthropology-sociology may petition to have this course waived.)

Introduction to the behavioral sciences. Major concepts, propositions, and theoretical orientations in cultural anthropology, sociology, and social psychology.

### **50.802 Social Foundations of Education**

Prep 50.801,

Social Foundations of Education

The functioning of educational institutions in their social and cultural milieu will be examined from anthropological and sociological perspectives. The school as a social system; influence of the stratification system, youth cultures, and racial antagonisms upon the educational enterprise.

### **50.803 Child Psychology**

Prep. General Psychology

The child as he develops from conception through the elementary school years with primary emphasis upon his emotional, social and intellectual development. Physical development is discussed only in its relation to these other factors. The child is considered in his home, peer, and school environment. Theoretical formulations of child behavior, particularly learning theory and psychoanalysis. Case history material.

### **50.804 Adolescent Psychology**

Prep. General Psychology

Social, emotional, and intellectual development through the adolescent years. Problems in family relationships and in the adolescent's social environment as well as his adjustment in school. Case history material.

### **50.805 Personality and Social Structure**

Prep. Permission of Instructor

Human behavior from a combined psychodynamic and sociological point of view, with special emphasis on socialization and the relations between the individual and the collectivity. The integration of relevant theories from psychology, sociology, and anthropology.

### **50.806 Psychology of Learning and Thinking**

The basic principles and conditions of acquisition, retention, and transfer of learning.

**50.807 Abnormal Psychology**

How personality becomes disordered. Problems of neurosis, character disorders, psychomatic disorders, and psychoses. Current methods of clinical diagnosis and treatment will be reviewed.

**50.815 Research Methods in Education**

An introduction to scientific methods of research in education and related fields. Stress will be placed on a critical reading and understanding of research literature, formulating research hypotheses, the formulation of a research proposal, and carrying out an individual or group project.

A course in statistics or competence in this field is strongly advised prior to taking this offering. A no-credit, no-charge course in statistics has been arranged for this purpose and is available through the University's Center of Programmed Study. The regular tuition course, 50.816, is also available.

**50.816 Statistics**

A first course in the statistical techniques used in educational research and in psychological testing. Measures of central tendency, variability, correlation, chi square, analysis of variance, and multiple regression will be among the topics considered. The student's mathematical background need not be beyond elementary algebra.

**50.830 History of Educational Thought I**

Educational theory and practice from antiquity to the Reformation. An attempt will be made to apply sociological and philosophical viewpoints to systems of education, beginning with primitive societies and continuing through Oriental civilizations, the classical period of Greece and Rome, the early and medieval Christian eras, the Renaissance period and the Reformation.

**50.831 History of Educational Thought II**

Prep. 50.830, History of Educational Thought I

The development of educational theory and practice from the time of the Reformation to the present. Among the topics considered are the transition from humanism to realism in education; rationalism and naturalism as these are reflected in education; the impact of psychology upon education; the growth of the curriculum; the "new" education.

**50.832 Philosophy of Education**

Analysis of the various philosophies of education with reference to their historical background and with particular emphasis upon their relation to contemporary educational practice.

**SPECIAL EDUCATION AND REHABILITATION***Speech Pathology and Audiology***50.901 Psychology of Exceptional Children**

A general orientation to the total field of special education, including the types and extent of various school and school-related services.

**50.902 Organization and Management of Public-School Speech-Therapy Programs**

The process of identifying children who need speech therapy; planning therapy, organizing the program, organizational procedures, in-service training, speech therapy in the public schools, the clinical point of view in the process of learning.

**50.903 Seminar: Cerebral Palsy**

Neuromuscular involvements and concomittant language and speech disorders; intellectual deficits, psychological deviations, communicative disorders of a cerebral palsied population; testing, placement, and management of the cerebral palsied child and adult with emphasis on a multidisciplinary approach.

**50.904 Seminar: Aphasia and Related Neurological Disturbances**

Language disturbances associated with and related to brain damage; CVA, organic brain syndrome, space-occupying lesions, and prenatal, paranatal, and postnatal injuries; recent advances in aphasia; diagnostic and therapeutic techniques; coordinated approach.

**50.905 Seminar: Functional and Organic Disorders of Voice**

Physiology and neurology of the laryngeal mechanism; the laryngoscopic examination. Voice disorders as learned behavior as a result of organic, neurological, and/or psychological deviation. Evaluation, referral, and management.

**50.906 Seminar: Language Disturbances in Children**

Minimal cerebral dysfunction and its effect on language acquisition and use in the communicatively disturbed child; behavioral patterns of the nonverbal child; concepts of delayed development of language; evaluation and management.

**50.911 Seminar: Stuttering**

Contemporary research in the field of stuttering. Elaboration of theories and their related therapies. Psychodynamics of stuttering behavior and empirical problems.

**50.912 Differential Diagnosis in Speech Pathology**

Evaluation, interpretation, and integration of test results; the application of standard psychological tests to speech and hearing disorders; analysis of patients' premorbid and morbid histories, medical and psychological diagnoses; design and execution of therapeutic procedures, proper referral techniques and report writing; practicum situation.

**50.913 Clinical Externship**

Practicum in hospitals and/or rehabilitation centers; supervised externships under the direction of qualified speech pathologists, audiologists, and medical personnel.

**50.914 Clinical Audiometry I**

The use of pure tone and speech reception instrumentation and hearing aid evaluation, the results and interpretation in the diagnosis of functional and organic disorders. Open to advanced undergraduates and graduates. Prerequisites: Introduction to Audiology and consent of instructor. Lectures, demonstration, observations, and practicum.

**50.915 Clinical Audiology II**

The process of identification and evaluation of hearing loss. Differential diagnosis. Tests for conductive, sensorineural, and retrocochlear involvements. A consideration of research findings in the area of hearing aid selection, auditory training, lip reading, and language training for hearing handicapped individuals. Prerequisites: Introduction to Audiology (see undergraduate Education catalog).

**50.916 Test Procedures in Speech and Language Pathology**

Procedures in evaluating organic and functional communication disorders using standard and nonstandard speech and language tests in University clinic situations. Demonstration and application of techniques, and objective reporting.

**50.917 Advanced Anatomy, Neurology, and Physiology of Speech-Hearing Mechanism**

Lectures and demonstrations by medical personnel. Emphasis on the head and neck. Admission by consent of adviser and medical supervisor. Prerequisites: Anatomy, Neurology, and Physiology of Speech and Hearing I; Introduction to Audiology, and Pathologies of the Ear. For advanced standing students.

**50.918 Pathologies of the Ear**

Lectures and observations in the organic and neurological pathologies of the ear; i.e., otitis media, Meniere's disease, and otosclerosis. Consideration of approaches to treatment. (medical setting)

**50.919 Clinical Audiometry II**

Specialized techniques (Bekesy, FGSR, EEG, Group Testing, and screening) the results and interpretation in the diagnosis of functional and organic hearing disorders. Prerequisites: Introduction to Audiology and Audiometry I. Lectures, demonstration, observations, and practicum.

**50.920 Physiological Acoustics**

A study of the human ear as an acoustical, mechanical, and electrical system. Psychophysical dimensions, calibrating procedures, methodologies of standardization and quantification of auditory response.

**50.921 Seminar: Audiology**

Differential diagnosis. Current research problems and areas of special interest to the students.

**50.922 Seminar: Functional and Organic Disorders of Speech**

Diagnosis, prognosis, and remediation of articulatory disorders as learned behavior, as a result of organic and/or psychological deviation. Evaluation, referral, and management. Prerequisites: Anatomy I, Organic Disorders, and graduate standing.

*Teaching the Emotionally Disturbed Child***50.930 Etiology, Dynamics, and Treatment of Emotional Disturbances in Children**

The etiology, dynamics, diagnosis and treatment of emotional disturbance in children. Special attention to emotional blocks to learning. The different kinds of referral agencies and their role in treatment.

**50.931 Special Class Methods with Emotionally Disturbed Children**

The development of techniques, skills, methods, activities and procedures valuable in working with emotionally disturbed children.

**50.932 Group Dynamics**

Emphasis on understanding the deeper questions of group growth, behavior, and action fundamental to developing solutions to the complex problems of group life. Students will learn to act democratically and as a group, to examine their strengths and weaknesses, to make decisions, to become alert to new ideas and actions, to discover the pulse of a group, and why one group is productive while another is nonproductive. The group will examine intensively such areas as group process, sociodrama, sociometric techniques, attitude testing, social action project development, and communication blocks in human relations.

**50.933 Mental Health**

Conditions leading to the most effective social adjustment. The relationship between the maturation process and mental health, the pre-determinants of maladjustment and its prevention, special stress on those factors that encourage the attainment of emotional maturity. Information bearing on mental health from the fields of psychiatry, psychology, sociology, physiology, and medicine will be synthesized and evaluated.

**50.934 Case Conferences on Emotionally Disturbed Children**

This course will be conducted in seminar style in connection with the student's practicum. Case presentations by outstanding resource persons will be thoroughly examined and discussed. Students will also be expected to make their case presentations to the seminar.

**50.935 Socio- and Psychodynamics of Family Life**

This course will cover internal and external dynamics of family life and the significance of such dynamic features to emotional disturbance in the child.

**50.999 Directed Study in Special Education**

Students will have an opportunity to do research on special problems which block learning of the emotionally disturbed child. Staff members from our Rehabilitation Research Institute will provide special supervision on problems of sampling, coding, statistics, data process analysis, etc. Educators will provide special supervision on the classroom problems of the emotionally disturbed child.

*Rehabilitation Administration***50.950 Introduction to Rehabilitation**

An overview of and orientation to the field of rehabilitation, including its historical development, legislative involvement, psychological implications, and sociological dimensions. Emphasis is placed on co-ordinating and integrating services as they relate to the field of rehabilitation as a community process.

**50.951 Principles of Medical Rehabilitation**

The wide spectrum of disabilities that could profit from rehabilitation, including orthopedic, neurological, medical, surgical, and mental disabilities. Basic principles of medical rehabilitation important for the administrator to know will be presented. Psychological aspects of disability will also be discussed.

**50.952 Vocational Rehabilitation**

The various phases of the vocational rehabilitation process, including such matters as guidance, counseling, placement, arranging for physical restoration and other services, eligibility determination, establishing a rehabilitation plan and vocational objective.

**50.953 Organization and Administrative Theory**

The body of conceptual knowledge regarding organizational and administrative theory will be examined. Formal and informal organizations, organizations as social systems, status and role concepts, leadership in organizations, power structure, relationships to authority, decision-making, and communication in and between organizations.

**50.954 Essentials of Supervision in Rehabilitation**

The relationship between the rehabilitation counselor and his supervisor. The essentials of supervision that apply in all leader-subordinate relations. However, the course will be primarily clinically oriented to the actual problems that arise in the daily working situation. Case material reflecting real problems.

**50.955 Administering a Rehabilitation Setting**

Factors common to administering a rehabilitation agency, whether it be a state agency, private agency, sheltered workshop, rehabilitation center, or hospital rehabilitation program. Caseload management, budgeting, purchasing of supplies and equipment, job descriptions, recruiting personnel, program planning, building in-service training, human relations in administration, interpreting research data reports, etc., and applying these findings in a meaningful way.

**50.956 Community Planning in Rehabilitation**

What the administrator needs to know about community planning to plan a program in his state. Basic principles of community planning, community organization, and community dynamics, as well as inter-disciplinary relations in rehabilitation. Examples of community planning from different rehabilitation agencies. The problems in the referral process among agencies.

**50.957 Federal-State Relations in Rehabilitation**

The complex network of federal-state relations and their implications for rehabilitation. Grant procedures, matching formulas, public relations and VRA directives, state and federal legislation pertinent to rehabilitation.

**50.958 Social Welfare and Vocational Rehabilitation**

Acquainting rehabilitation administrators with the broad field of social welfare. The course will review the historical backgrounds of the relationship between vocational rehabilitation and social welfare and the more recent fast-moving developments in the relationship of these fields. Mutual referral processes between the welfare and rehabilitation groups will be considered.

**50.959 Practicum in Rehabilitation Research**

Under the supervision of the Regional Rehabilitation Institute, students will have an opportunity to develop a research design on some aspect of rehabilitation administration and to carry out the necessary research operations involved.

**50.960 Practicum in Rehabilitation Administration**

Students will be assigned to a variety of rehabilitation agencies for their practicum experience. Problem-solving relevant to experiences encountered in internship.

**50.962 Administration of a Sheltered Workshop**

Special problems of administering a sheltered workshop, such as community planning, work evaluation, job-training, labor relations, contracting, production, and occupational placement.

**50.964 Rehabilitation and the Law**

This course is designed to sensitize rehabilitation administrators to the impact of legislative developments upon the field of rehabilitation. Special emphasis will be placed on understanding the legal implications for rehabilitation of the latest Vocational Rehabilitation Administrative Amendments, workmen's compensation laws, eligibility determination criteria, and Social Security Amendments.

**50.965 Occupational Placement**

A study of the dynamics of moving the rehabilitation client into the world of work within the framework of the specific community structure. Development of facility in use of resource materials in occupational information, job description and analysis, performance appraisal, training, and vocational assessment. The personnel point of view toward the handicapped will be discussed and analyzed, and more effective placement practices will be developed.

## **INSTRUCTION**

**51.800 Principles of Teaching**

A consideration of the rational bases for effective teaching. Efforts are made to relate learning theory and educational objectives to various strategies and tactics of teaching. The functions of the teacher are examined as components of learner development.

**51.801 Curriculum of the American School**

Designed for in-service and prospective teachers, principals, and supervisors who seek experience and assistance in dealing with such problems as the following: improving and enriching the subject curriculum; developing a core curriculum.

**51.802 Evaluation and Measurement**

Evaluation techniques and principles for use in the classroom at all levels. The importance of establishing teaching objectives as a basis for evaluation. A brief review of statistical techniques necessary for dealing with objective-type test scores and marking procedures. Considerable emphasis will be placed on improving teacher-made tests, especially objective tests, and the student will be required to construct an objective test in his teaching field.

**51.805 Student Teaching with Related Seminar**

(See requirements under Student Teaching)

A University arranged practicum of observation and teaching in schools offering comprehensive programs within reasonable commuting distance of Northeastern. Participating on a full-time basis, the student is expected to develop planning and communication abilities within his major field. Biweekly seminars at the University provide additional opportunity to analyze theory-practice relationships and to examine generic problems of teaching.

**51.810 Elementary Arithmetic Concepts for Teachers**

The conceptual approach to the teaching of the arithmetic of whole numbers and rational numbers.

**51.811 Elementary Number Concepts for Teachers**

The concepts of the real number system and its subsystems underlying school mathematics.

**51.812 Elementary Algebraic Concepts for Teachers**

Prep. 51.811, Elementary Number  
Concepts for Teachers

The algebraic concepts underlying school mathematics, including variables, open sentences, order, modulo systems and polynomials.

**51.813 Elementary Geometric Concepts for Teachers**

Prep. 51.811,  
Elementary Number Concepts for  
Teachers

The geometric concepts underlying school mathematics, including logic, abstraction, measurement, congruence, curves, coordinate systems, and graphs.

**51.815 Seminar in Mathematics and Science in the Elementary School**  
Prep. Approval of instructor

The practical aspects of coordinating a K-6 science and mathematics program in a public-school district.

**51.820 Review of High School Mathematics**

The laws of reasoning underlying the basic operations of our number system; fractions, decimals, per cent; fractions in algebra; factoring and its uses; exponents and radicals; logarithms, progressions; series; solution of equations; determinants; complex numbers; important theorems from theory of equations.

**51.821 Review of High School Mathematics II**

The basic facts and concepts of geometry; evaluation of formulas; proportion and variation; trigonometry; analysis of verbal problems; functions and graphs; fundamentals of plane analytic geometry; locus problems; introduction to differential and integral calculus. If time permits, the concept of sets will be introduced.

**51.822 Methods of Teaching High School Mathematics**

This course meets the state requirements for certification to teach secondary school mathematics. Emphasis upon presentation of the structures of mathematics and the part they play to develop the inter-relatedness of the high school mathematics curriculum.

**51.823 Concepts of Modern High School Mathematics**

This course deals primarily with the content of junior high school mathematics. Sets, systems of numeration, algebraic structures, equations and inequalities, graphs of linear functions, and problem-solving.

**51.824 Introduction to Modern Geometry for Teachers**

Topics in non-Euclidean geometries, projective geometry, and topology and methods of making proofs: truth tables, Boolean algebra, syllogisms, contrapositives, and mathematical induction.

**51.825 Seminar in Mathematics Curricula**

Prep. Approval of instructor

Existing and proposed curricula in school mathematics. Students will be expected to prepare curricula for existing school systems.

**51.826 College Algebra for Teachers** Prep. 51.812, 51.823, or  
mathematics teaching experience

The operations in the real number system and related notation, with special emphasis on logical methods and reasoning. Time permitting, several important topics from the theory of equations will be included.

**51.827 Trigonometry and Analytic Geometry for Teachers**

Prep: 51.812, 51.823, or  
mathematics teaching experience

The essentials of trigonometry with applications, fundamentals of analytic geometry with applications to proofs in plane geometry, limits, and polar coordinates.

**51.828 Introduction to Calculus for Teachers** Prep: 51.812, 51.823, or  
mathematics teaching experience

Differentiation and integration, limits and continuity, and such other topics as rates, maxima and minima, graphs, and areas will be included as time permits.

**51.829 Mathematics in General and Vocational Education**

The place of mathematics in general and vocational education, the selection of content for such courses, and appropriate methods of teaching them.

**51.830 Concepts of Earth Science for Elementary Teachers**

Selected topics in the earth sciences considered from a philosophical and/or historical point of view, with laboratory work.

**51.831 Concepts of Biology for Elementary Teachers**

Selected topics in the biological sciences considered from a philosophical and/or historical point of view, with laboratory work.

**51.832 Concepts of Physical Sciences for Elementary Teachers**

Selected topics in the physical sciences considered from a philosophical and/or historical point of view, with laboratory work.

**51.833 Teaching Elementary School Science** Prep. 51.831, Concepts  
of Biology for Elementary  
Teachers; 51.832, Concepts  
of Physical Sciences for  
Elementary Teachers

The teaching of elementary school science from both a practical and philosophical point of view. Materials, resources, and methods, as well as several areas of science subject matter.

**51.834 Elementary Science Curriculum**

A general course in content and methods of teaching science in the elementary school classroom. Satisfies one elementary specialized-methods course requirement.

**51.835 The Teaching of High School Science I**

The first half of a two-quarter course, principally for secondary school teachers. Problems of observations of scientific facts, their discovery, the derivation of scientific principles from elaboration of hypotheses, experimentation and reasoning with these facts will be analyzed in terms of the learning process. The different fields of science will be considered, stressing especially their interdependence and their unity of methods and of reasoning.

**51.836 The Teaching of High School Science II**

Continuation of 51.835, The Teaching of High School Science I. During the second half of the course, plans for modern science courses in various fields will be elaborated.

**51.840 The Teaching of English in the Secondary School**

A basic methods and materials course designed to strengthen the teacher's understanding of the role and function of English in the curriculum. Emphasis will be placed upon literature and language skills including grammar, composition, spelling and reading. The course will include a review, analysis, and evaluation of current materials in secondary school English, and students will be assisted in the preparation and presentation of effective lesson plans.

**51.845 The Teaching of Modern Languages in the Secondary School**

Through the case method and group discussions, the most effective types of class activities, subject unit presentation, assignments, examinations, and aids used in teaching modern languages will be considered. The role of the language laboratory with its problems of selecting equipment, scheduling pupils, planning tapes and content of drill exercises, evaluating results and coordinating its functions with conventional classroom instructions will be discussed and demonstrated.

**51.850 The Teaching of Social Studies**

Developments in methods, materials, and curriculum. Consideration will be given to such topics as the following: the teacher of the social studies; objectives of social studies instruction; social studies programs; controversial issues; current events; visual and auditory aids; field trips; evaluation.

**51.851 Current Political and Social Issues in the Social Studies**

A content approach to problems of political and social significance which have contemporary relevance for teachers of the social studies on a secondary level.

**51.855 The Teaching of General Business Subjects**

Current trends in the teaching of social business subjects, such as general business, economics, economic geography, business law, and consumer education. Objectives, nature of subject matter, teaching aids and devices, tests and measurements, textbooks, and supplementary materials are studied.

**51.861 Principles of Programmed Instruction**

The development and current status of self-instructional devices. A survey of available programs and teaching machines, with emphasis on the details of the construction evaluation of programs.

**GRAPHIC SCIENCE****51.901 Descriptive Geometry I**

The theory of projection drawing, orthographic, axonometric, and perspective. Principle and auxiliary views involving problems of angularity, parallelism, perpendicularity.

**51.902 Descriptive Geometry II**

Advanced work involving intersections, developments, and topographical problems.

**51.903 Graphics, Geometry and Mathematics**

Relationship between graphical methods, geometry, and elements of algebra and trigonometry. Locus concepts applied to conics and other technical curves. Foncharal scales and their relation to technical charts, slide rules and elementary nomography.

**51.904 Principles and Teaching of Technical Drawing**

Selection of views sections and conventions, dimensions and specifications for shop-working detail and assembly drawings.

**51.905 Machine Drawing and Design**

Prep. 51.905, Principles and  
Teaching of Technical Drawing or its equivalent

Basic production processes, common machine elements, working detail and assembly drawings and their relationships to the design of operation.

**51.906 Graphical Analysis**

Prep. 51.903, Graphics, Geometry, and  
Mathematics or its equivalent

Curve fitting and empirical equations; design of more advanced slide rules and nomographs; graphical differentiation and integration; vector geometry and elementary mechanism analysis.

**51.907 Electrical and Electronic Graphics**

Graphics as used in the design and presentation of electrical, electro-mechanical and electronic devices including common symbols, specialized charts and diagrams.

**51.908 Graphics in Architecture**

Graphics as used in the design and development of architectural structures. From preliminary sketches to final presentation including site planning, detailed working drawings, delineation, entourage, etc.

**51.909 Creative Projects in Graphics**      Prep. Approval of instructor

Individually approved, graphics-related projects requiring the definition, analysis and research of a problem and the design development and final presentation of a solution. Problems of academic, pedagogical, construction, interdisciplinary, research, nature may be investigated.

**51.910 Principles of Computer Programming**

Methods and techniques of programming digital computers. Data processing and problem-solving in areas of science and mathematics using the Fortran language.

## **ADMINISTRATION**

**52.800 Introduction to Educational Administration**

A view of the conceptions, purposes, and functions of educational administration and the role of the educational administrator.

**52.801 Curriculum Development, Supervision, and School-Community Relations Programs**      Prep. 52.800, Introduction to Educational Administration

An interrelated approach to patterns of curriculum development, supervision of the instructional programs, and school-community relations programs. Assessing the pertinent relationship between modern approaches, research findings and current practices in the field will be utilized as the study technique of these facets of the educational administrator's responsibilities.

**52.802 School Law, Staff and Pupil Personnel Administration Programs**      Prep. 52.800, Introduction to Educational Administration

Development of a basic understanding of federal and state laws that are applicable to education and educational personnel as well as the legal prerogatives available to local boards of education. Purposes, patterns and issues in staff and pupil personnel-administration programs are major considerations of the course.

**52.803 Principles of Administrative Organization, School Finance, and School Business Management Practices**

Prep. 52.800, Introduction to Educational Administration

The practices and issues in school business management on both the school-district and school-unit levels. The study of school finance includes the rationale for public support of schools, a look at selected state-aid programs and current practices and issues of local-support patterns in public education. Patterns of administrative organization.

**52.804 The School Principalship**

The total responsibilities of the school principal will be considered in this course. School-unit administrative principles and practices will be presented that are common to both elementary and secondary school positions. Differences between elementary and secondary practices will be discussed.

**52.805 Simulated Administration Workshop**      Prep. 52.800, Introduction to Educational Administration or permission of the workshop director (limited to an enrollment of 15 students)

The workshop is designed to place each student in a simulated decision-making situation. Background materials have been prepared which describe all aspects of a fictitious school system including its publics, its policies, its certificated and non-certificated staff members and its geographical and socio-economic makeup. These background data are disseminated through motion pictures, film strips, and taped interviews with influential people in the fictitious community as well as through written materials.

Credits: 4 quarter hours (except when offered during Summer quarter as extended workshop with 8 quarter hours of credit)

**52.806 Practicum in Educational Administration**      Prep. 52.800, Introduction to Educational Administration and invitation of the instructors

The practicum is a field-service experience for candidates with outstanding potential as school administrators. Students will be involved in aiding the administration of a public school system to survey its educational program and administrative policies and practices. Data gathering, interpretation and recommendations will be made to the superintendent for the solution of selected problems.

The practicum will meet for a 4-hour period once a week for the three quarters.

Credits: 12 quarter hours.

**52.807 Advanced Seminar on Educational Administration**

Student is confronted with major issues facing the school and its administrators. Great emphasis is placed upon developing and understanding the relationships between field practice and research.

## GUIDANCE

### **53.800 Foundations of Guidance**

The philosophical and interdisciplinary foundations of guidance. The major issues about the reality of life, cultural and social change, freedom and responsibility, the process of helping people through counseling, and the establishment of goals for the profession.

### **53.801 Tests and Test Procedures**

The principles and problems of psychological testing as applied to the field of education in general, and guidance in particular, are discussed. Some consideration is given to elementary statistical concepts as they apply to the treatment, use, understanding, and interpretation of test scores. Selection of tests for system-wide use is discussed. The student is made familiar with some of the currently used tests of intelligence, scholastic aptitude, differential aptitudes, achievement, interest and personality. Emphasis is placed on evaluation tests for use in education and guidance. Problems of test interpretation are discussed briefly.

### **53.802 Vocational Development and Occupational Information**

A dual-emphasis course dealing, first, with theories about how individuals make decisions concerning their choice of vocation, and second, with the kind of data which is needed to assist people with these decisions. This requisite data deals with the following areas: the relationship of social and economic change to occupational trends; the classification and description of occupational fields; methods of collecting, evaluating, filing, and disseminating vocational information; and the role of the counselor in fulfilling these functions.

### **53.803 Counseling I**

Theories of counseling and major issues relating to theories of counseling. Discussion of theories to be studied will be illustrated and their relevance to the counseling process discussed and examination of the philosophical assumptions underlying each theory.

### **53.804 Counseling II**

Prep. 53.803, Counseling I;  
53.801, Tests and Test Procedures. 53.801 may be taken concurrently with this course.

A laboratory course for students in the secondary and higher education counseling programs. The counseling process and application of theory in developing a sound approach to the counseling relationship; the proper use of tests in counseling; role-playing and case studies.

## **53.805 Counseling Practicum**

**Practicum** Prep. 53.803, Counseling I,  
53.804, Counseling II, and permission of the instructor

The practicum in counseling represents the culmination of the counseling sequence; it consists of a supervised counseling experience in an actual guidance situation in a school, college, or private agency. The experience will include actual counseling time, individual student-supervisor conferences, and group seminars.

## 53.806 Field Work Practicum

Prep. 53.802. Vocational Development

and Occupational Information. 53.803. Counseling I.

and 53.804, Counseling II and permission of the instructor.

For prospective counselors who have no previous formal guidance experience in a school situation. The course consists primarily of a supervised field placement for the purpose of obtaining experience in various guidance activities. Provision will be made for some individual contacts with pupils, but the main emphasis will be on general guidance department functions. An attempt will be made, wherever possible, to place students in field situations consistent with their intended job goals.

## **53.807 Administration of Guidance Services**

Prep. 53.800, Foundations of Guidance

## 53.801. Tests and Test Procedures

#### **53.802. Vocational Development**

#### **and Occupational Information**

### 53.803, Counseling I

An advanced level guidance course designed to help meet the certification requirements for guidance directors in Massachusetts. The course will cover philosophies, principles, and methods of setting up and administering guidance programs in the public schools. Attention will be given to the various pupil personnel functionaries in the schools, their integration into the guidance team, and their relationship to the total school program. Scheduling guidance activities, setting up testing programs, developing record systems, and hiring and supervising staff will be among the topics discussed.

## 53.808 Group Counseling

Prep. 53.800. Foundations of Guidance

Theory, research, and practice of counseling with groups of students at all levels from elementary school to college. Also, a brief consideration

of group-guidance practices in the elementary and secondary schools, but with emphasis on developing initial knowledge and skills in group counseling.

### **53.809 Student Personnel Work in Higher Education**

Prep. 53.800, Foundations of Guidance

An introduction to the philosophy and practice of student personnel administration in colleges and universities. The various student personnel services such as admissions, housing, student activities, fraternities, and sororities, and faculty advising. Discussion of such general problems as academic climate, student unrest, and student censorship as they relate to the responsibility of the student personnel worker.

### **53.810 Counseling in the Elementary School**

Prep. 53.800, Foundations of Guidance;  
53.801, Tests and Test Procedure;  
53.803, Counseling I

A course for those planning to enter elementary school counseling. Consideration of counselor role at the elementary level, counseling practices, and a study of counseling cases. This course is preparation for the practicum.

### **53.823 Measurement of Intelligence: Stanford-Binet Scales**

Prep. 53.801, Tests and Test Procedures

Preparation to administer, score, and interpret the Stanford-Binet Test of Intelligence. Consideration of theories of intelligence as they apply to the Binet scales and their development; use of the test in educational settings. Each student will be required to administer and score 25 tests.

### **53.824 Measurement of Intelligence: Wechsler Scales**

Prep. 53.801, Tests and  
Test Procedures

Preparation to administer, score, and interpret the Wechsler Adult Intelligence Scale (WAIS) and the Wechsler Intelligence Scale for Children (WISC). Study of the theory and development of the test; its use in education and counseling. Each student will be required to administer 25 tests.

## READING

### **54.800 Introductory Reading and Language Skills for Certification Majors**

The introductory reading and language skills course for elementary teacher certification programs only. Techniques for teaching aural comprehension, speaking ability, reading and literature, grammar, spelling, and written composition. Integration of reading and language skills. Examination of word recognition, meanings, study skills, speed, and fluency growth areas of reading. Development of reading and language skills plans for classroom use.

### **54.801 Teaching Reading and Language Skills: Elementary Level**

Basic developmental reading-language skills course for elementary teachers. Essential reading, writing, speaking, and listening skills are presented and analyzed in the light of the most recent concepts of integrated learning at various grade levels. Practical work in developing well-integrated reading-language-skills plans for classroom use with average and above-average pupils will be emphasized.

### **54.802 Introduction to Reading Disability: Elementary Level**

Prep. 54.801, Teaching Reading and Language Skills, Elem. Level; or both  
54.135 and 54.136

Second course in the reading specialization sequence. Description and analysis of the reading processes in retarded readers. Review and evaluation of basic causes of reading retardation. Examination of the essential processes and skills involved in word recognition, meanings, study skills, rate and fluency, and related language skills.

### **54.803 Introduction to Reading Disability: Secondary Level**

Prep. 54.801, Teaching Reading and Language Skills, Elem. Level; or both  
54.135 and 54.136

Second course in the reading specialization sequence. Organization of the course is identical to 54.802, with emphasis placed on the secondary school pupil.

**54.804 Diagnosis and Correction of Reading Disability I**

Prep. 54.802, Introduction to Reading Disability,  
Elem. level; or 54.803, Introduction to Reading  
Disability, Second Level

Third course in reading specialization sequence at elementary or secondary levels. Diagnosis of specific reading, language, and study problems at all levels, integrated with corrective measures. Individual and group techniques will be investigated and practiced with retarded readers. A log or journal representing a comprehensive diagnostic and corrective program carried on with individuals and small groups during the year will be submitted and evaluated.

**54.805 Diagnosis and Correction of Reading Disability II**

Prep. 54.804, Diagnosis and Correction  
of Reading Disability I

Continuation of 54.804. Greater emphasis on corrective techniques with retarded readers. Writing of case studies. Log or journal describing diagnostic and corrective program and a case study evaluating progress will be submitted and evaluated.

**54.806 Practicum in Reading**

Prep. Approval of Instructor

For all prospective reading specialists at all levels. Demonstrations of remedial techniques in various skills at all grade levels. Actual lessons with various types of remedial readers, in small groups, will be presented, analyzed, and evaluated. New techniques, methods, and materials will be presented and discussed. A log or journal describing a diagnostic and corrective program carried on with a group of pupils will be submitted and evaluated.

**54.807 Research in Reading**

Prep. Approval of Instructor

Last course in the reading specialization sequence. Both elementary and secondary specialists included. A survey of research techniques including basic statistical concepts necessary for research, experimental design, data collection and interpretation. Focus on reading research at elementary or secondary level in one general area.

A specific topic will be selected and at least ten pieces of pertinent research will be evaluated. Also a research proposal will be submitted which will indicate a thorough knowledge of research procedures and skills as well as knowledge of a particular problem in reading.

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# **NORTHEASTERN UNIVERSITY**

## **UNDERGRADUATE COLLEGES**

**Offering full-time day curricula on the Co-operative Plan leading to baccalaureate degrees**

Boston-Bouvé College

College of Business Administration

College of Criminal Justice

College of Education

College of Engineering

College of Liberal Arts

\*College of Nursing

College of Pharmacy

**Offering part-time curricula during late afternoon and evening hours leading to associate and baccalaureate degrees**

Lincoln College

University College

## **GRADUATE DIVISION**

**Offering graduate curricula leading to master's degrees**

Graduate School of Actuarial Science

\*\*Graduate School of Arts and Sciences

Graduate School of Business Administration

Graduate School of Education

\*\*Graduate School of Engineering

Graduate School of Pharmaceutical Sciences

Graduate School of Professional Accounting

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\*Also offers a three-year Co-operative Program leading to the associate degree.

\*\*Also offers doctoral programs in certain fields.



Graduate School of Education  
Northeastern University / 360 Huntington Avenue  
Boston, Massachusetts 02115 / Tel. 617 • 266-0635





**n u**

**Graduate School of Engineering  
Northeastern University / 360 Huntington Avenue  
Boston, Massachusetts 02115 / Tel. 617 • 266-0635**



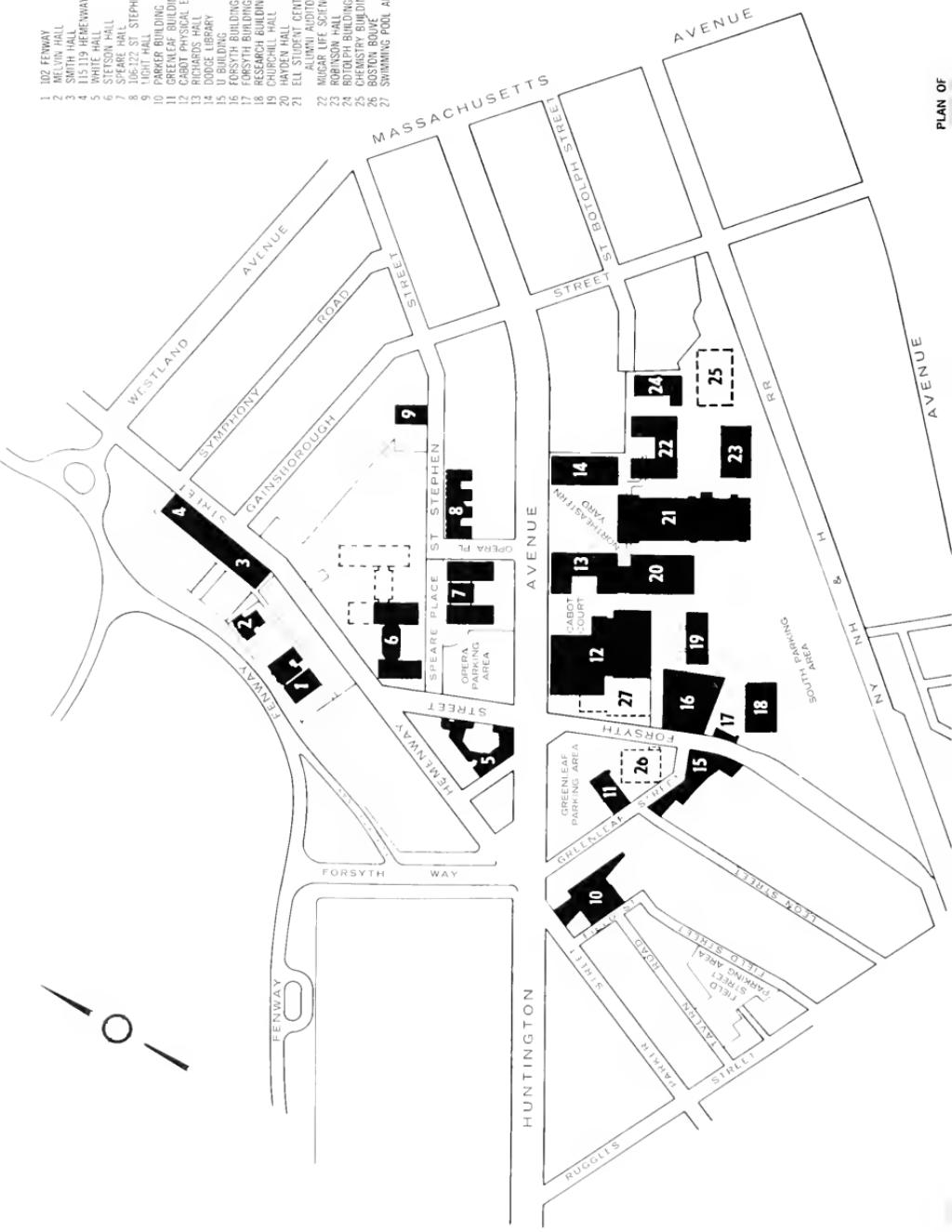
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12	CABINET PHYSICAL EDUCATION CENTER
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15	FORSYTH BUILDING
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17	FORSYTH BUILDING Annex
18	ELL STUDENT CENTER AND
19	CHURCHILL HALL
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21	ALUMNI AUDITORIUM
22	MUSAR LIFE SCIENCES BUILDING
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# *Aims and Scope of the University*

Founded in 1898, Northeastern University is incorporated as a privately endowed nonsectarian institution of higher learning under the General Laws of Massachusetts. The State Legislature by special enactment has given the University general degree-granting powers. The University is governed by a Board of Trustees who are elected by and from the Northeastern University Corporation, which is composed of more than 150 distinguished business and professional men.

From its beginning Northeastern University has had as its dominant purpose the discovery of community educational needs and the meeting of these in distinctive and serviceable ways. The University has not duplicated the programs of other institutions, but has sought to pioneer new areas of educational service.

A distinctive feature of Northeastern University is its Co-operative Plan, initiated by the College of Engineering in 1909 and subsequently adopted by the Colleges of Business Administration (1922), Liberal Arts (1935), Education (1953), Pharmacy (1962), Nursing (1964), Boston Bouvé College (1964), and the College of Criminal Justice (1967). This time-tested educational method enables students to gain valuable practical experience as an integral part of their college programs and also provides the means by which they may contribute substantially to the financing of their education. The Plan has been extended to the graduate level in engineering, mathematics, sociology, actuarial science, the pharmaceutical sciences, and professional accounting.

In the field of adult education, Northeastern University offers graduate and undergraduate degree programs and non-credit programs which are specifically designed to meet the needs and interests of adults who wish to further their education on a part-time basis.

All formal courses of study leading to degrees in the Graduate Division, Lincoln College, and University College are approved by the undergraduate faculties concerned, and are governed by the same qualitative and quantitative standards as the regular day curricula. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and at other off-camps locations near Boston.

The following is a brief outline of the aims and scope of the University's programs.

## UNDERGRADUATE COLLEGES

### BOSTON-BOUVÉ COLLEGE

Boston-Bouvé College offers three major programs of study — Physical Education, Recreation, and Physical Therapy. Students earn the degree of Bachelor of Science in Education.

The combined programs of liberal arts, science, and professional preparation include field experience and student teaching, and leadership training in camping and outdoor education at the Warren Center for Physical Education and Recreation in Ashland. In accordance with Northeastern's Co-operative Plan of Education, students are offered varied opportunities for alternate terms of work-study experience during upper-class years.

### COLLEGE OF BUSINESS ADMINISTRATION

The College of Business Administration offers programs of study in the principal fields of business leading to the degree of Bachelor of Science in Business Administration. These programs are offered on the five-year Co-operative Plan, under which students gain substantial practical experience in the fields for which they are preparing as an integral part of their undergraduate course of study.

The College also sponsors a Management Institute which offers various special courses for business and industrial executives. One phase of the Institute's work is carried on by the Center for Management Development, which annually conducts an intensive program designed to provide professional growth for middle management executives who will ultimately be called upon to carry broader executive responsibilities. The plan of instruction, based on a modification of the Northeastern Co-operative Program, permits the participants to maintain their job responsibilities during the six-month period of the course. The Management Development Program is conducted at Andover, Massachusetts, on the campus of Andover Academy.

A Bureau of Business and Economic Research, concerned particularly with problems of the New England region, is an integral part of the College. The Bureau conducts research projects under faculty leadership using undergraduate and graduate co-operative students as research assistants.

### COLLEGE OF CRIMINAL JUSTICE

The College of Criminal Justice offers full-time day curricula on the Co-operative Plan leading to the degree of Bachelor of Science with concentration in the field of law enforcement.

### COLLEGE OF EDUCATION

The College of Education offers programs leading to the degree of Bachelor of Science in Education. These are designed particularly to meet the needs of high school graduates who desire to prepare themselves for teaching or administrative positions in elementary and secondary schools. Curricula are offered on the five-year Co-operative Plan, which provides for employment in libraries, social service agencies, and school systems.

## **COLLEGE OF ENGINEERING**

The College of Engineering offers five-year co-operative curricula in civil, mechanical, electrical, chemical, and industrial engineering leading to the degree of Bachelor of Science with specification according to the engineering department in which the student qualifies. A six-year program in power systems engineering in collaboration with public utilities leads to both the bachelor's and master's degree in electrical engineering. The College also offers during evening hours a part-time program leading to the degree of Bachelor of Science in Electrical Engineering. This program extends over eight years, covers the identical courses given in the day co-operative curriculum, and meets the same qualitative and quantitative standards of scholarship.

## **COLLEGE OF LIBERAL ARTS**

The College of Liberal Arts offers majors in the usual fields of the arts and sciences leading to the degree of Bachelor of Arts. With the exception of preprofessional programs, curricula are normally five years in length and operated on the Co-operative Plan.

## **LINCOLN COLLEGE**

Lincoln College offers technology programs leading to the Associate in Engineering and Bachelor of Engineering Technology degrees. It also offers science technology and paramedical technology programs leading to the Associate in Science degree.

In addition to its traditional curricula, Lincoln College offers interdisciplinary and certificate programs providing technological and professional development opportunities to meet the special needs of part-time students.

## **COLLEGE OF NURSING**

The College of Nursing offers two separate and distinct programs of study, both organized on the Co-operative Plan:

- (a) A three-year curriculum in preparation for the R.N. Examinations and leading to the Associate in Science degree.
- (b) A five-year curriculum also preparing students for the R.N. Examinations, and leading to the degree of Bachelor of Science in Nursing.

Five of Boston's leading hospitals — Beth Israel, Children's Hospital Medical Center, New England Deaconess, Peter Bent Brigham, and Massachusetts General — collaborate with Northeastern by providing suitable co-operative work opportunities during the upper-class years of these programs.

## **COLLEGE OF PHARMACY**

The College of Pharmacy offers five-year co-operative curricula leading to the degree of Bachelor of Science in Pharmacy. Co-operative placement begins with the sophomore year and continues for three years, the senior year being devoted to full-time study at the University.

## UNIVERSITY COLLEGE

University College, so called because it draws upon the resources of the other colleges of the University, offers part-time programs in Liberal Arts, Business Administration, Law Enforcement and Security, and Health Care Administration, leading to the Associate in Science and Bachelor of Science degrees. Special-program certificates may also be earned, and workshops and seminars are offered for degree credit.

University College does not duplicate the offerings of the day colleges, but provides curricula which cut across traditional subject-matter areas to meet the particular needs of adult students who may be employed full-time or enrolled full-time in professional schools affiliated with Northeastern University. In co-operation with the Forsyth School for Dental Hygienists, University College offers a two-year day curriculum leading to the Associate in Science degree.

University College and Lincoln College offer a joint program in Medical Technology conducted in affiliation with a number of hospital schools of medical technology approved by the American Medical Association. Students receive a Bachelor of Science degree from University College and they may write the examination for certification as a registered medical technologist (ASCP).

Students may enroll as degree candidates or elect single courses appropriate to their needs and interests. Courses are scheduled in the day and evening at the Boston Campus, Suburban Campus in Burlington, and other off-campus locations near Boston.

## GRADUATE DIVISION

The Graduate Division of the University offers day and evening programs. It is made up of the following Graduate Schools, which offer programs leading to the degrees listed:

### ACTUARIAL SCIENCE

Master of Science in Actuarial Science.

### ARTS AND SCIENCES

Master of Arts, Master of Science; Ph.D. in Biology, Chemistry, Mathematics, Physics, and Psychology.

### BUSINESS ADMINISTRATION

Master of Business Administration.

### EDUCATION

Master of Education.

### ENGINEERING

Master of Science with course specification, including a special six-year program in Power Systems Engineering leading to both bachelor's and

master's degrees in Electrical Engineering; a similar six-year program in Mechanical Engineering leading to both bachelor's and master's degrees; and Ph.D. in the fields of Electrical, Chemical, and Mechanical Engineering.

### **PHARMACEUTICAL SCIENCES**

Master of Science with specialization in Hospital Pharmacy, Industrial Pharmacy, Medicinal Chemistry, and Pharmacology.

### **PROFESSIONAL ACCOUNTING**

A five-quarter curriculum leading to the degree of Master of Science in Accounting.

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Some of these programs are offered on the Co-operative Plan; others provide teaching and research fellowships for able candidates. Administrative headquarters for all graduate programs are located in the Graduate Center Building.

## **PROGRAMS FOR ADULT WOMEN**

These programs were developed to meet the needs of women with family or other obligations who wish to engage in part-time study during the day. Non-credit courses and undergraduate and graduate degree programs are offered at the Boston and Burlington campuses. Included are courses from the Graduate School of Education, the Graduate School of Arts and Sciences, University College, and the Center for Continuing Education. A Human Relations and Adult Counseling Program is also offered. Men may enroll in most courses.

## **CENTER FOR CONTINUING EDUCATION**

The Center for Continuing Education was established to relate the University to the needs of its community in a period of accelerated change. Its programs are composed of seminars, conferences, institutes, forums, and a wide variety of special courses designed to serve specific needs. The Division of Special Programs, working co-operatively with trade associations and professional societies, offers a wide variety of programs dealing with current needs and problems. Through its Division of Community Services, working with governmental agencies and community organizations, the Center is becoming increasingly involved in social problems on both the local and national level.

Many of these programs are conducted at Henderson House, Northeastern University's conference center in Weston, Massachusetts.

## AFFILIATED PROGRAMS

### FOR DENTAL HYGIENISTS

The Forsyth School for Dental Hygienists conducts a two-year program of dental hygiene education and general education in co-operation with Northeastern University. Graduates of the program receive the Certificate in Dental Hygiene from Forsyth and the degree of Associate in Science from Northeastern.

### FOR MEDICAL TECHNOLOGISTS

In co-operation with the New England Baptist and the New England Deaconess Hospitals, Northeastern University offers a full-time day program on the Co-operative Plan leading to the degree of Bachelor of Arts.

### FOR NURSES

Northeastern University offers instruction in the sciences, humanities, and social studies for student nurses from the New England Deaconess and Children's Hospital Medical Center Schools of Nursing.

## RESEARCH ACTIVITIES

The faculties of the University are engaged in a wide variety of basic research projects in business, science, social science, pharmacy, and engineering. These are co-ordinated by the Dean of Research, whose services are University-wide and available to the faculties of all the Colleges.

Although Northeastern is primarily concerned with undergraduate and graduate instruction, the University believes that the most effective teaching and learning takes place in an environment characterized by research activities directed toward extending the frontiers of knowledge.



# *Buildings and Facilities*

Northeastern University is located on Huntington Avenue in the Back Bay section of Boston. The main administrative offices of the University are located in Richards Hall.

The chief railroad centers of Boston are the North and South Stations. To reach the University from the North Station, board an MBTA subway car going to Park Street and transfer there to any Huntington Avenue car. To reach the University from South Station, board a Cambridge-bound subway train and transfer at Park Street to a Huntington Avenue car. The "Northeastern" station is the first stop outside the subway.

## HUNTINGTON AVENUE CAMPUS

The principal educational buildings of Northeastern University are located on Huntington Avenue on 16 acres of a 47-acre site in the Back Bay section of Boston. Only one block to the west of the University lie the famous Boston Museum of Fine Arts and the beautiful public gardens-park reservation known as "The Fenway." A map of the Huntington Avenue Campus appears on page 4.

Following a long-range development plan, University facilities have expanded substantially in recent years. In addition to nine new buildings, all constructed within the past 25 years, several modernized older buildings are available for specialized uses. The newer buildings are interconnected by means of tunnels.

In addition to classrooms and instructional offices, the principal buildings and facilities are:

**Botolph Building.** Civil Engineering Laboratories.

**Cabot Physical Education Center.** Facilities for physical education and athletics; gymnasium; cage; rifle range.

**Churchill Hall.** Graduate Division; Physics Laboratories; faculty and staff cafeteria.

**Dodge Library.** Library; Center for Programmed Instruction; Engineering drawing rooms; Language Laboratory.

**EII Student Center.** Student activities; chapel; auditorium; student cafeteria; bookstore; student lounges and meeting rooms.

**102 The Fenway.** Center for Reading Improvement; Stearns Center for Research; gymnasium.

**Forsyth Building.** Laboratories for Industrial Engineering, Mechanical Engineering, and Allied Medical Sciences; planetarium; University Infirmary and Health Services.

**Greenleaf Building.** ROTC headquarters; research facilities.

**Hayden Hall.** Lincoln College; University College; Colleges of Business Administration, Education, Engineering, and Liberal Arts; Electrical Engineering Laboratories.

**Mugar Life Sciences Building.** College of Pharmacy; laboratories for Biology, Chemical Engineering, and Psychology.

**Research Building.** Research facilities for Electrical Engineering and Physics.

**Richards Hall.** Administrative offices; laboratories for Chemistry and Mechanical Engineering; bookstore.

**Robinson Hall.** Boston-Bouvé College; College of Nursing; laboratories for Biology and Physical Therapy; radio and television facilities.

**United Realty Building.** Research facilities for Mechanical Engineering, Biology, Psychology, and Chemistry; Institute for Rehabilitation.

### SUBURBAN CAMPUS AT BURLINGTON

In order to meet the needs of individuals and of industry in the area, Northeastern University has established a Suburban Campus near the junction of Routes 128 and 3 in Burlington, Massachusetts.

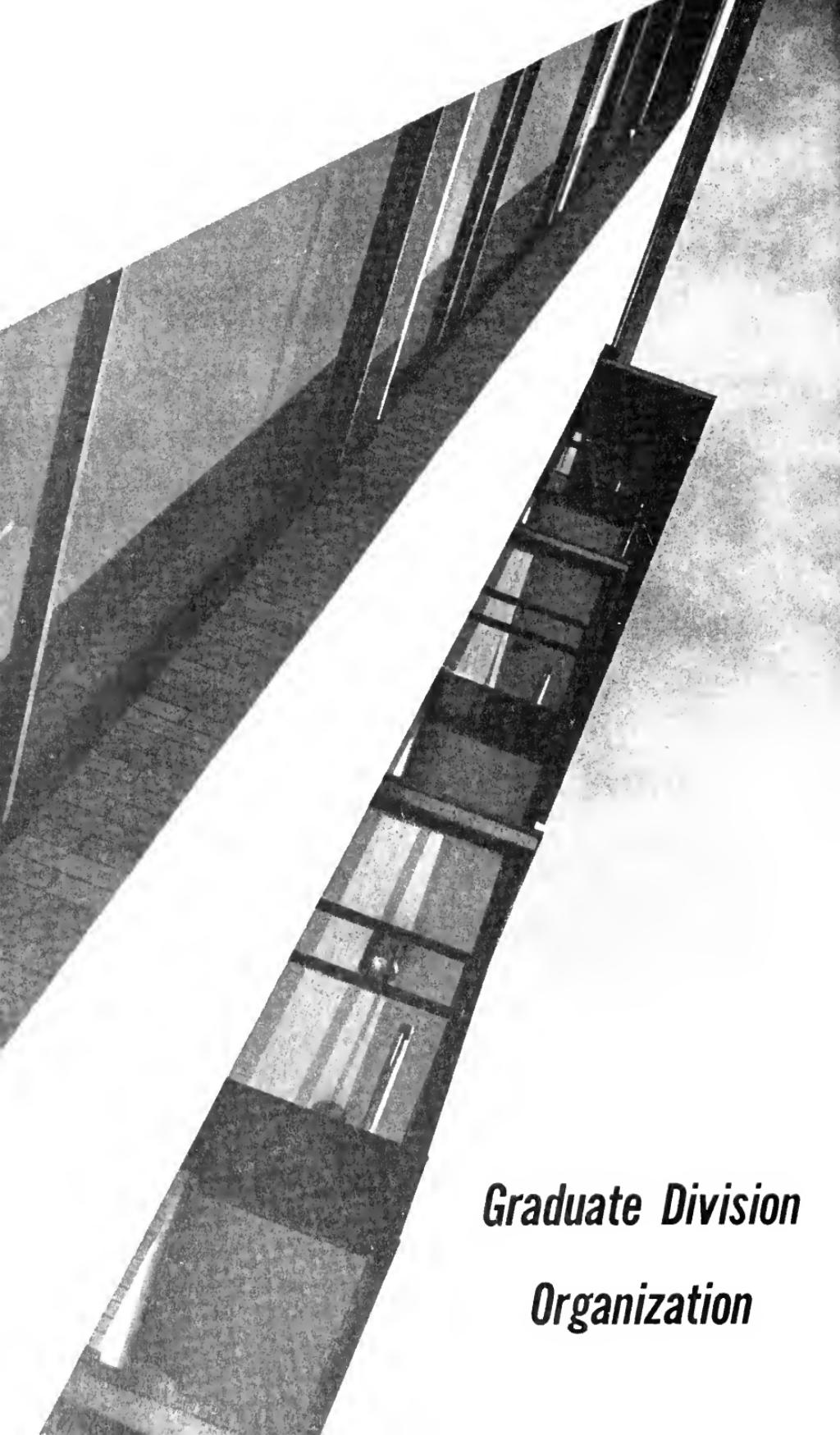
In addition to graduate courses in engineering, physics, mathematics, business, science, education, and the arts, portions of undergraduate programs leading to the Associate and Bachelor of Science degrees, special programs for women and non-credit state-of-the-arts programs in the form of seminars, conferences, institutes, forums, and "released-time" programs are offered.

### HENDERSON HOUSE

At Henderson House in Weston, Massachusetts, Northeastern University operates one of the nation's finest off-campus centers for continuing education. Adults enroll in short-term courses, seminars, and special institutes at this conference center, located 12 miles from the main campus on Huntington Avenue.

### WARREN CENTER

A 70-acre tract in Ashland, including a small lake, is being developed for use as a laboratory for instruction in physical education and recreation.



*Graduate Division*

*Organization*

## **Graduate Schools and Degree Programs**

**GRADUATE SCHOOL OF ACTUARIAL SCIENCE**  
**MASTER OF SCIENCE IN ACTUARIAL SCIENCE**

**GRADUATE SCHOOL OF ARTS AND SCIENCES**

**MASTER OF ARTS DEGREES**

in the fields of

ECONOMICS, ENGLISH, HISTORY, POLITICAL SCIENCE,  
PSYCHOLOGY, and SOCIOLOGY-ANTHROPOLOGY

**MASTER OF SCIENCE DEGREES**

in the fields of

BIOLOGY, CHEMISTRY, HEALTH SCIENCES,  
MATHEMATICS, and PHYSICS

**DOCTOR OF PHILOSOPHY DEGREES**

in the fields of

BIOLOGY, CHEMISTRY, MATHEMATICS, PHYSICS, AND PSYCHOLOGY

**GRADUATE SCHOOL OF BUSINESS ADMINISTRATION**

**MASTER OF BUSINESS ADMINISTRATION**

**GRADUATE SCHOOL OF EDUCATION**

**MASTER OF EDUCATION**

**GRADUATE SCHOOL OF ENGINEERING**

**MASTER OF SCIENCE DEGREES**

in the fields of

CHEMICAL, CIVIL, ELECTRICAL, INDUSTRIAL,  
and MECHANICAL ENGINEERING, and  
ENGINEERING MANAGEMENT

**DOCTOR OF PHILOSOPHY DEGREES**

in the fields of

CHEMICAL, ELECTRICAL, and MECHANICAL ENGINEERING

**GRADUATE SCHOOL OF PHARMACEUTICAL SCIENCES**

**MASTER OF SCIENCE IN HOSPITAL PHARMACY**

**MASTER OF SCIENCE IN INDUSTRIAL PHARMACY**

**MASTER OF SCIENCE IN MEDICINAL CHEMISTRY**

**MASTER OF SCIENCE IN PHARMACOLOGY**

**GRADUATE SCHOOL OF PROFESSIONAL ACCOUNTING**

**MASTER OF SCIENCE IN ACCOUNTING**

## GRADUATE DIVISION

### GENERAL ADMINISTRATION

Arthur A. Vernon, B.S., M.S., Ph.D.	Dean of the Graduate Division
Janice Walker, A.B.	Registrar of the Graduate Division
W. Dennis Stires, B.S.	Administrative Assistant in the Graduate Division
Richard E. Sprague, B.S., B.B.A., M.B.A., Ed.M.	Administrative Assistant in the Graduate Division

### DIRECTORS OF THE GRADUATE SCHOOLS

Bernard J. Brent, B.S., M.S., Ph.D.	Graduate School of Pharmaceutical Sciences
Geoffrey Crofts, B.Comm., F.S.A.	Graduate School of Actuarial Science
Ray C. Dethy, B.S., M.A., Ph.D.	Graduate School of Education
Joseph M. Golemme, B.S., M.A.	Graduate School of Professional Accounting
George W. Hankinson, A.B., S.B., M.S.	Graduate School of Engineering
Daniel J. McCarthy, A.B., M.B.A., D.B.A.	Graduate School of Business Administration
Arthur A. Vernon, B.S., M.S., Ph.D.	Graduate School of Arts and Sciences

### UNIVERSITY GRADUATE COMMITTEE

**1966-67**

The responsibility of the committee is the determination of broad policies and regulations governing the conduct of graduate work. All new graduate programs must be approved by the committee.

#### Administrative Members

Arthur A. Vernon, Chairman	Dean of the Graduate Division and Director of the Graduate School of Arts and Sciences
Janice Walker, Secretary	Registrar of the Graduate Division
Bernard J. Brent	Professor of Medicinal Chemistry and Director of the Graduate School of Pharmaceutical Sciences
Geoffrey Crofts	Dean of the Graduate School of Actuarial Science
Ray C. Dethy	Assistant Dean of Education and Director of the Graduate School of Education
Arthur E. Fitzgerald	Dean of the Faculty
Joseph M. Golemme	Director of the Graduate School of Professional Accounting
Carlo E. Gubellini	Acting Dean of Business Administration

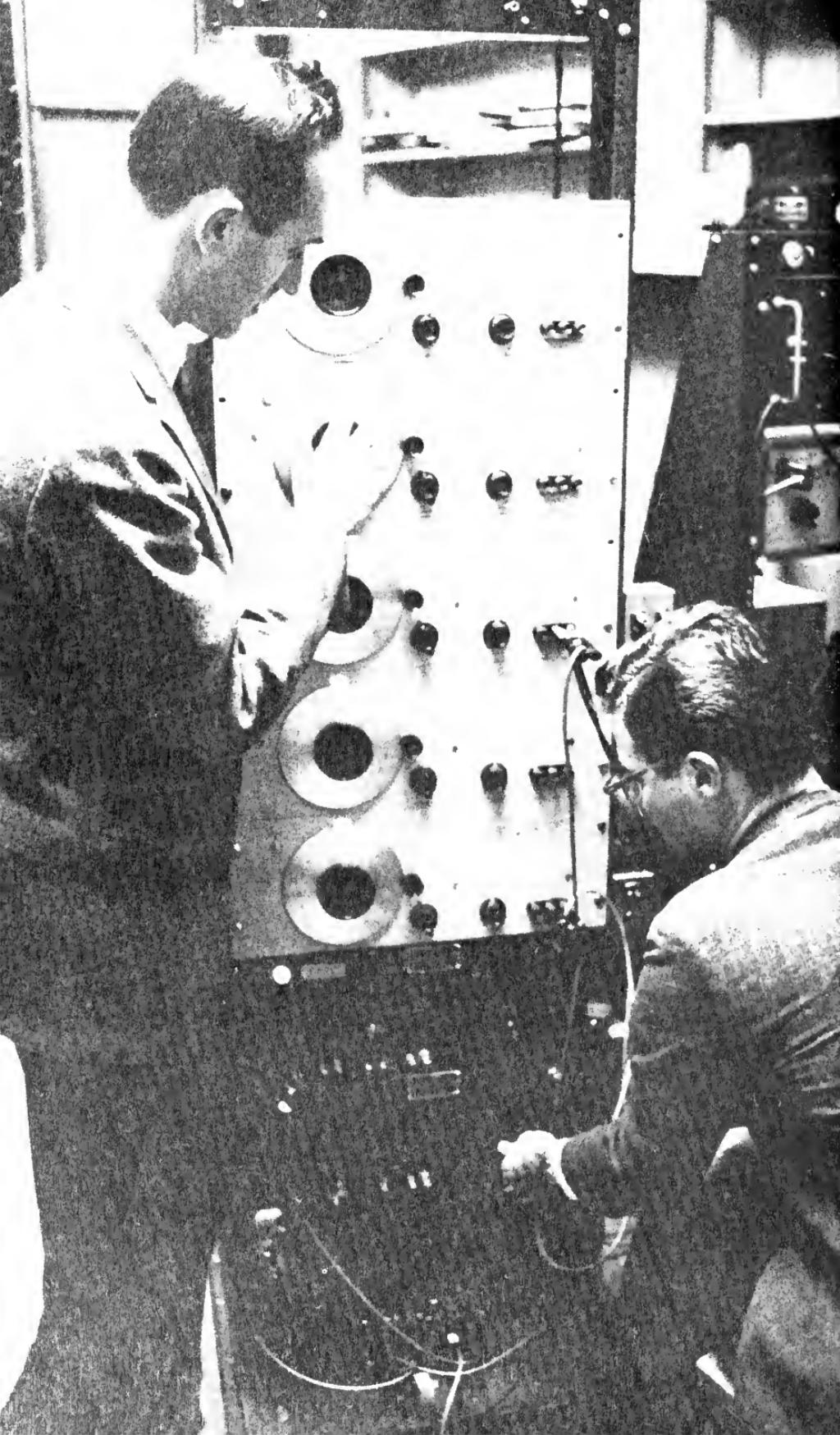
George W. Hankinson	Assistant Dean of Engineering and Director of the Graduate School of Engineering
LeRoy C. Keagle	Dean of Pharmacy
Wilfred S. Lake	Dean of Liberal Arts
Frank E. Marsh, Jr.	Dean of Education
Daniel J. McCarthy	Associate Dean of Business Administration and Director of the Graduate School of Business Administration
Kenneth G. Ryder	Dean of Administration
Ronald E. Scott	Dean of Engineering

**Elected Faculty Members****Terms Expire September, 1967**

Anker V. Andersen	Associate Professor of Accounting
David R. Cook	Associate Professor of Education
Robert J. Ferullo	Associate Professor of Special Education
Bernard M. Goodwin	Associate Professor of Chemical Engineering
John F. Reinhard	Professor of Pharmacology and Chairman of the Department
Nathan W. Riser	Professor of Biology and Director of the Marine Science Institute
Anghel N. Rugina	Professor of Economics and Finance
Robert A. Shepard	Professor of Chemistry and Chairman of the Department
Albert H. Soloway	Associate Professor of Medicinal Chemistry
Ernest L. Spencer	Professor of Civil Engineering and Chairman of the Department

**Terms Expire September, 1968**

Wendell R. Brown	Associate Professor of Social Science Education
John F. Dunn	Professor of Mechanical Engineering
George M. Krause	Professor of Pharmacy
Robert W. Mullins	Associate Professor of Management
Robert J. Minichiello	Associate Professor of Marketing
Harold R. Raemer	Professor of Electrical Engineering and Chairman of the Department
Raymond H. Robinson	Professor of History and Chairman of the Department
George B. Rochfort, Jr.	Associate Professor of Education
Elliot Spector	Professor of Pharmacology
A. Bertrand Warren	Professor of Psychology and Chairman of the Department



# *General Graduate Division Regulations*

## **REGISTRATION**

Students must register in the Graduate Division Office at the times specified by the Graduate School calendar.

## **PROGRAM CLASSIFICATIONS**

Students who have registered for a degree program in the Graduate Division are given a program classification in one of the curricula listed in the catalog. Students who are not pursuing a specific degree program are entered upon the Graduate Division records as special.

## **RESIDENCE**

All work for advanced degrees must be completed in residence at the University unless approval has been obtained from the Dean of the Graduate Division for work taken elsewhere. Students who are in residence and are using the facilities of the University must register for such work.

## **PROGRAMS OF STUDY**

At the time of his first registration, each full-time student must develop, with the assistance of his faculty advisor, a complete program of study for the degree for which he is registered. All subsequent changes must be approved by his faculty advisor.

Evening part-time students will be expected to complete the required courses outlined by each department, after which the elective courses may be undertaken. The study load for such students is limited to a program of two courses per quarter unless special permission to carry a heavier load is given by the director of the graduate school concerned.

## GRADING SYSTEM

The performance of students in graduate courses will be recorded by the instructor by use of the following grades:

- A. Excellent  
This grade is given to those students whose performance in the course has been of very high graduate caliber.
- B. Satisfactory  
This grade is given to those students whose performance in the course has been at the level necessary for graduate credit.
- C. Fair  
This grade is used to indicate that the student's performance in the course may be acceptable but is not consistently at the level expected in graduate work.
- F. Failure  
This grade is used to indicate unsatisfactory work.

In addition, the following letter designations are used:

- I. Incomplete, without quality designation. This is used when a student does not take the final examination or otherwise fails to complete the work of the course.
- S. Satisfactory, without quality designation. This designation is used for thesis and seminar work.
- W. Withdrawn without prejudice.

The designation "I" will be changed to a grade upon removal of the deficiencies which caused the grade of "I" to be reported. Such deficiencies must be removed within four weeks after the quarter ends, or the grade of "I" will be changed to a grade of "F." If the deficiencies are due to a missed final examination, permission to take a make-up must be obtained from the director of the respective graduate school within one week following the date of the missed examination, and the examination must be made up at the time specified by the Graduate Division.

## WITHDRAWALS

Students who wish to withdraw from a course after the start of the quarter must file an official withdrawal form in the Graduate Division Office. Any student who is absent for three class periods in succession without excuse will be dropped from the class.

The University provides all instruction and accommodations on an academic quarter basis; therefore, no refunds are granted except in cases where students are compelled to withdraw because of personal illness or other reasons beyond their control. In no case are refunds made after a student has attended the fifth session of a class. Questions regarding refunds should be discussed with the Bursar's Office.

## **CLASS HOURS AND CREDITS**

All credits are entered as quarter hours. A quarter hour is defined as the equivalent of one hour in class and two hours of outside preparation for twelve weeks. A quarter hour of credit is equivalent to three fourths of a semester hour credit. All classes meet on a quarter basis. In the summer session, classes meet for six-week periods. The academic calendar for each graduate school should be consulted in order to determine the opening and closing dates of the sessions.

## **INTERVIEW AND REGISTRATION DATES, OFFICE HOURS, AND CLASS SCHEDULES**

For dates of the interview and registration periods and office hours, consult the calendar pages. Circulars listing the times at which courses are given are issued at the beginning of the academic year. Copies of these circulars may be obtained from the office of the Graduate Division, Northeastern University, Boston, Massachusetts 02115, or by calling 262-1100.

## **THE MASTER'S DEGREE**

### **ADMISSION**

Specific requirements for each department will be found in the appropriate paragraph under each departmental heading. The necessary material for admission for full-time graduate study must be filed by March 15, unless other filing dates are indicated by the respective graduate schools. Applications for all fields except for those in the Graduate Schools of Actuarial Science, Pharmaceutical Sciences, and Professional Accounting should be made directly to the Graduate Division Office.

For admission to any part-time program, a personal interview with the director of the appropriate graduate school or the head of a department is required. Transcripts of the applicant's prior college training must be presented at that time. If this is not possible, such material must be filed within six weeks after registration or the student will be asked to withdraw.

### **ACADEMIC CLASSIFICATIONS**

After review of an applicant's transcript of undergraduate work, those students who are admitted are given an academic classification as regular or provisional. Those who have a bachelor's degree from an accredited program with acceptable quality of undergraduate work are classified as regular. Those who have an undergraduate record which is not acceptable for regular classification are classified as provisional. Provisional students must obtain a B average in the first 16 quarter hours of credit work for which they register in order to continue in the Graduate Division. Students whose records are not satisfactory may be dropped prior to the completion of this amount of work. When provisional students obtain a B average in the first 16 quarter hours of credit work, they will be classified as regular students. The Graduate Division requirements apply to both classified and special students.

## GENERAL REQUIREMENTS

A candidate for the master's degree must complete satisfactorily an approved program conforming to the requirements of the department or graduate school in which he is registered.

The requirements for the master's degree are a minimum of 40 quarter hours of correlated work of graduate caliber, together with such other study as may be required by the department or graduate school concerned. Department chairmen and the directors of the graduate schools are available for counsel on the selection of electives.

## ACADEMIC REQUIREMENTS

In order to qualify for the master's degree, an average no lower than B must be obtained in the necessary quarter hour credits required for the degree. If a grade of F is obtained in a required course, this course must be repeated with a passing grade. If a grade of C is obtained in a required course, this course may be repeated once only. If a grade of F is obtained in an elective course, this course may be either repeated with a passing grade, or another elective course may be substituted for it. In order to satisfy the academic requirements for the degree, three extra courses will be allowed for students in all graduate schools except the Graduate School of Education, in which two extra courses will be allowed.

## COMPREHENSIVE EXAMINATION

At the discretion of the department, a final written or oral comprehensive examination may be required. No candidate may present himself for the final comprehensive examination without the permission of his faculty advisor. Such examinations must be taken at least two weeks before the commencement at which he expects to receive his degree.

## THESIS

If a thesis is required in partial fulfillment of degree requirements, it must show independent work based in part upon original material. The thesis should show evidence that the student has a thorough acquaintance with the literature of a limited field and must meet the approval of the department or graduate school concerned.

Instruction concerning the details of preparation of the thesis may be obtained from the Graduate Division Office.

## FOREIGN LANGUAGE REQUIREMENT

Some departments require an examination to show evidence of ability to read one or more foreign languages. This reading knowledge is established by an examination arranged by the department concerned.

## TRANSFER CREDITS

After a student has been accepted for graduate study toward the master's degree he may submit a request for transfer credit. A maximum of 12 quarter hours of graduate credit may be accepted toward a master's degree if such work is approved by the director of the graduate school concerned or the Departmental Graduate Study Committee. Transfer credit will be considered only if the work is consonant with the objectives of the graduate program and if the grades in the courses are A or B. No grades on transfer credits may be used for purpose of obtaining the academic average necessary for completion of the degree requirements.

## TIME LIMITATIONS

Course credits earned in the program of graduate study are valid for a maximum period of eight years. This time limitation is likewise applicable to any accepted transfer credits.

## THE DOCTOR'S DEGREE

Northeastern University offers programs leading to the degree of Doctor of Philosophy in the following fields: chemical engineering, electrical engineering, mechanical engineering, chemistry, mathematics and physics.

The degree is awarded to candidates who give evidence of proficiency, high attainment, and research ability in their major field and who have satisfied the specific requirements of the department in which they are enrolled.

## GENERAL REQUIREMENTS

A minimum of 40 quarter hours of graduate course work is required for those studying for the doctoral degree. The amount above this is specified for each candidate by the departmental graduate committee. The other requirements include a qualifying examination, completion of the residence requirement, a comprehensive examination, demonstration of foreign language proficiency, completion of an approved thesis, and a final oral examination. It is the responsibility of departmental graduate committees to certify to the Graduate Division the completion of each requirement.

## RESIDENCE REQUIREMENT

Candidates for the doctoral degree must spend the equivalent of at least one academic year in residence at the University taking graduate work and/or working on a thesis. Each department specifies the method by which the residence requirement is satisfied. The period of residence must be continuous; however, it need not be on a full-time basis.

**DEGREE CANDIDACY**

After 40 quarter hours of graduate work have been taken with satisfactory grades and after successful completion of the qualifying examination, a student is established as a degree candidate.

**QUALIFYING EXAMINATION**

In order to become a doctoral degree candidate, each student must pass a qualifying examination. This examination may be either written or oral, or both, at the discretion of the department.

**COMPREHENSIVE EXAMINATION**

During the time in which a student is a candidate for a doctoral degree, he must demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of such degree.

**COURSE REQUIREMENT**

The course requirements, in addition to the minimum requirement of 40 quarter hours' credit, are established by the departmental graduate committee for each candidate.

**THESIS**

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication. This work should give evidence of the candidate's ability to carry out independent investigation and interpret in a logical manner the theoretical and/or experimental results of the research. The original bound copy of the thesis will be retained by the Library. Northeastern University reserves publication rights to the material presented in the thesis.

**FOREIGN LANGUAGE**

Before a candidate may take the final oral examination, he must demonstrate a foreign language proficiency as required by the department. This reading knowledge is established by the examination administered by the department in which the candidate is registered.

**FINAL ORAL EXAMINATION**

The final oral examination will be taken after completion of all other requirements for the degree. This examination cannot be held until after the thesis has been received in the Graduate Division Office and must be held at least two weeks before the commencement at which the degree is to be awarded.

The committee for the final oral examination for the doctoral degree is appointed by the departmental graduate committee, and the Dean of the Graduate Division is notified of the time of the examination.

The final oral examination will include the subject matter of the doctoral thesis and significant developments in the field of the thesis work. Other fields may be included if recommended by the examining committee.

### **TRANSFER CREDIT**

The graduate course work which a student must take beyond the basic 40 quarter hours is established by each departmental graduate committee, and if transfer credit is desired for any of this work, approval of the departmental graduate committee must be obtained. In general, no more than one half of the course work required beyond the basic 40 credits will be accepted for transfer credit.

### **TIME LIMITATION**

After admission to degree candidacy, a maximum of five years will be allowed for the completion of the degree requirements.

### **REGISTRATION**

The program of each student must be approved by his advisor before registering in the Graduate Division Office.

### **CLASSIFICATION OF DOCTORAL CANDIDATES**

1. Students who have completed 40 quarter hours of graduate work and have been accepted by the department for doctoral study, but have not yet passed the qualifying examination, are classified as pre-doctoral students.
2. Students who have completed 40 quarter hours of graduate work and have passed the qualifying examination are classified as doctoral students.

### **INTERDISCIPLINARY PROGRAMS**

Some graduate students may wish to pursue doctoral programs whose boundaries overlap substantially into two or more departments. In such cases, an interdisciplinary program may be established which is adequate in scope and depth for doctoral standards, but does not agree exactly with the individual departmental regulations. For such possibilities, the following plan is in operation:

### **ADMISSION**

It is expected that students enrolled in graduate work at Northeastern University and who wish to apply for an interdisciplinary doctoral program, will complete the requirements for the master's degree in an established course of study. The department in which the student completed his master's degree work will act upon the request to pursue an interdisciplinary program. If such an application is approved, the department will serve as the registration department for the doctoral degree requirements.

If an applicant has obtained a master's degree from another institution and wishes to pursue an interdisciplinary doctoral program at Northeastern University, an application to do so should be filed with an appropriate department which is authorized to award the doctoral degree. This department will act upon the request and, if granted, will serve as the registration department.

### **FORMATION OF INTERDISCIPLINARY COMMITTEE**

A student who has been accepted by a department for an interdisciplinary program must find an advisor who will direct his doctoral thesis. This advisor will be chairman of the interdisciplinary committee for this student. A second member will be appointed by the chairman of the registration department. These two members may obtain a third member or request the Dean of the Graduate Division to do so. At least two departments must be represented on the committee. The chairman of the registration department will notify the Dean of the Graduate Division of the membership of the committee as soon as arrangements are complete.

### **DUTIES OF INTERDISCIPLINARY COMMITTEE**

The chairman of the interdisciplinary committee will serve as the registration officer to approve the course registration for the student. A copy of the approved course registration must also be filed with the departmental committee member. The departmental committee member will serve as the reporting and recommending representative to the departmental graduate committee of the registration department.

The interdisciplinary committee will be responsible for the administration of the qualifying examination, language examination, approval of the thesis, and comprehensive examination. This committee must also certify to the registration department the completion of the requirements for the award of the doctoral degree.

The interdisciplinary committee must assure that the program of the student represent standards comparable to those of the registration department and that the program is not so broad that it has inadequate depth in any area.

The program of the student may be reviewed at any time by the Dean of the Graduate Division to determine whether objectives of the program are being met. If any questions arise, they should be discussed with the interdisciplinary committee.

# *Tuition and Fees*

## **TUITION**

### **CO-OPERATIVE PROGRAMS**

Graduate School of Actuarial Science .....	\$425 per quarter
Graduate School of Arts and Sciences .....	\$400 per quarter
Graduate School of Engineering .....	\$525 per quarter
Graduate School of Pharmaceutical Sciences .	\$525 per quarter
Graduate School of Professional Accounting .	\$500 per quarter

### **FULL-TIME DOCTORAL PROGRAMS**

Graduate School of Arts and Sciences .....	\$500 per quarter
Graduate School of Engineering .....	\$525 per quarter

### **OTHER GRADUATE PROGRAMS**

Graduate School of Arts and Sciences	
Courses on Huntington Avenue	
Campus .....	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit
Graduate School of Business Administration	
Courses on Huntington Avenue	
Campus .....	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit
Graduate School of Education	
Courses on Huntington Avenue	
Campus .....	\$25 per quarter hour credit
Courses on Burlington Campus	\$25 per quarter hour credit
Guidance Practicum .....	\$100
Student Teaching .....	\$200
Graduate School of Engineering	
Courses on Huntington Avenue	
Campus .....	\$31 per quarter hour credit
Courses on Burlington Campus .	\$35 per quarter hour credit

**FEES**

**REGISTRATION FEE** ..... \$10.00

Payable at time of first registration in all graduate schools except for non-degree students in the Graduate School of Education.

**LATE PAYMENT FEE** ..... \$ 5.00

For failure to pay tuition on due date.

**MAKE-UP FEE** ..... \$ 5.00

**MEDICAL INSURANCE FEE** ..... \$18.00

For full-time students.

**STUDENT CENTER CHARGES**

Graduate School of Actuarial Science

Co-operative Students ... \$10.00 per ten-week term of registration

Graduate School of Arts and Sciences

Co-operative Students ... \$12.50 per quarter of registration

Other Full-Time Students . \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Business Administration

Full-Time Students ..... \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Education

Full-Time Students ..... \$12.50 per quarter of registration

Part-Time Students

Registered on the

Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

Graduate School of Engineering

Co-operative Students ... \$12.50 per quarter of registration

Other Full-Time Students . \$12.50 per quarter of registration

Teaching and Research

Fellows ..... \$ 6.25 per quarter of registration

Graduate Co-operative

Teaching Assistants ... \$ 6.25 per quarter of registration

Graduate Co-operative

Research Assistants .. \$ 6.25 per quarter of registration

**Part-Time Students**

Registered on the  
Huntington Avenue

Campus ..... \$ 0.75 per quarter of registration

**Graduate School of Pharmaceutical Sciences**

Co-operative Students . . . \$12.50 per quarter of registration

**Graduate School of Professional Accounting**

Co-operative Students . . . \$12.50 per quarter of registration

**GRADUATION FEE** ..... \$25.00

Payable by all students at time of award of degree.

**PAYMENTS**

Tuition statements will be mailed to the students by the Student Accounts Office and are payable on or before the date specified. Checks should be drawn payable to "Northeastern University."

**FINANCIAL AID**

Northeastern University has available fellowships and assistantships for students who are engaged in graduate work. The Graduate Division will send candidates the proper application blanks upon request.

**TEACHING ASSISTANTSHIPS**

Teaching assistantships are available in most of the departments giving graduate work. Holders of such assistantships carry a half-time academic load and devote half time to academic assistance in the departments. The assistantship grant includes a stipend and remission of tuition.

**TUITION FELLOWSHIPS**

Some departments have available tuition fellowships which cover six to nine quarter hours of graduate work per quarter. In return, students will be required to assist in the academic work of the department. These fellowships are normally given to students who are in the first year of graduate work.

**RESEARCH FELLOWSHIPS**

Research fellowships are available in some departments giving graduate work. Holders of such fellowships carry a half-time academic load and devote half time to academic assistance in the departments. The fellowship grant includes a stipend and remission of tuition.

## DOCTORAL RESEARCH FELLOWSHIPS

In the departments which give work leading to the Ph.D. degree, research fellowships are available for students who have established candidacy for the Ph.D. degree. These fellowships carry remission of tuition, and the stipend is higher than that for the research fellowships.

## GRADUATE CO-OPERATIVE TEACHING ASSISTANTSHIPS

Some engineering departments have graduate co-operative teaching assistantships available for students for the master's degree on the Co-operative Plan. Holders of these assistantships alternate periods of academic work with periods of assistance in the department according to the co-operative calendar. Remission of tuition is given in addition to the compensation for the assistantship.

## GRADUATE CO-OPERATIVE RESEARCH FELLOWSHIPS

Some engineering departments have graduate co-operative research fellowships available for students studying for the master's degree on the Co-operative Plan. Holders of such fellowships alternate full-time research work with academic work according to the co-operative calendar. Remission of tuition is given in addition to the compensation for the fellowship.

## APPOINTMENTS

Appointments to fellowships and assistantships are ordinarily announced by April 15 for the following academic year or summer. Appointments are for a maximum of one year and are not automatically renewed.

## FULL-TIME DUTIES

Graduate students who hold teaching assistantships and research fellowships, graduate co-operative teaching assistantships, or graduate co-operative research fellowships are expected to devote full time to their studies and the duties of the grant. They may not accept outside employment without the consent of their faculty advisor and the Dean of the Graduate Division.

## NATIONAL DEFENSE STUDENT LOAN PROGRAM

Under the National Defense Education Act of 1958, a long-term loan program was established to provide financial assistance to students in need of such aid to continue their education. In 1964, this act was amended to permit participation by students carrying at least one half the normal full-time academic workload as determined by the University.

The maximum amount which may be borrowed in one academic year is \$2,500. The total of loans made to a student for all years, including any loans made to him as an undergraduate, may not exceed \$10,000. The actual amount of any award will be determined by the financial position of the student and his family (if applicable) and the availability of funds. Preference is given to outstanding students.

Repayment of these loans begins nine months after the date the borrower ceases to carry, at an institution of higher education, at least one half the normal full-time academic workload as determined by that institution. The repayment period extends ten years from that point and may be further extended by periods for which he is legally entitled to deferment.

Up to 50 per cent of any such loan (plus interest) shall be canceled for services as a full-time teacher in a public or private nonprofit elementary or secondary school and in institutions of higher education at a rate of 10 per cent (plus interest) for each complete academic year of service, or its equivalent. For services in a school district determined to have a high concentration of students from low-income families, the cancellation rate is 15 per cent for each complete year of service; and an additional 50 per cent of any loan (plus interest) may be canceled.

Additional information and appropriate application forms are available through the Graduate Division Office or from the Office of Financial Aid. The application deadline is September 1 for full-time students or one month prior to the start of the quarter for which aid is requested in the case of half-time students.



GRADUATE SCHOOL



*Degree Programs  
of the  
Graduate School of Engineering*

Master of Science Degrees  
in the fields of  
Chemical, Civil, Electrical, Industrial, and Mechanical Engineering,  
and Engineering Management

Doctor of Philosophy Degrees  
in the fields of  
Chemical, Electrical, and Mechanical Engineering

**ACADEMIC CALENDAR 1967-68****Summer Session 1967**

Registration Period for Former Students	Monday-Friday	May 29-June 9
*Interview and Registration Period for New Students	Monday-Friday	May 29-June 9
Classes Begin	Monday	June 19
Independence Day, No Classes	Tuesday	July 4
Classes End	Tuesday	July 25
Examination Period	Wednesday-Saturday	July 26-July 29

**Fall Quarter 1967**

Registration Period for Former Students	Monday-Saturday	Aug. 7-Aug. 26
*Interview and Registration Period for New Students	Monday-Saturday	Aug. 21-Sept. 9
Classes Begin	Monday	Sept. 18
Columbus Day, No Classes	Thursday	Oct. 12
Thanksgiving Day, No Classes	Thursday-Friday	Nov. 23 & 24
Examination Period	Monday-Friday	Nov. 27-Dec. 1

**Winter Quarter 1967-68**

Change of Registration for Former Students	Monday-Friday	Nov. 27-Dec. 1
*Interview and Registration Period for New Students	Monday-Friday	Nov. 27-Dec. 1
Classes Begin	Monday	Dec. 11
Christmas Vacation, No Classes	Saturday-Monday	Dec. 23-Jan. 1
Washington's Birthday, No Classes	Thursday	Feb. 22
Examination Period	Monday-Friday	Mar. 4-Mar. 8

**Spring Quarter 1968**

Change of Registration for Former Students	Monday-Friday	Feb. 26-Mar. 1
Classes Begin	Monday	Mar. 18
Patriot's Day, No Classes	Friday	Apr. 19
Final Grades for June Graduates Taking Third Quarter Courses	Friday	May 24
Memorial Day, No Classes	Thursday	May 30
Examination Period	Monday-Friday	June 3-June 7

\*Appointments for interviews with new students must be made at least four days before the date of the interview.

## GENERAL INFORMATION

The curricula of the degree programs are given under each departmental heading. The descriptions of courses offered by the several departments are given so that prospective students may obtain a view of the course coverage. Preparation courses are indicated when necessary. Not all courses are offered every year, but the course offerings will be arranged in such a manner that students may make continuous progress toward the degree.

The number of students enrolled in each class will be limited to permit effective teaching at the graduate level, and the University reserves the right to cancel any course for which an insufficient number of students apply.

## FELLOWSHIPS

The departments of the Graduate School of Engineering have two types of fellowships available. Some departments have teaching assistantships and research fellowships for students enrolled in work leading to the master's degree. The departments which give doctoral degrees also have research fellowships for such students.

## CO-OPERATIVE PROGRAMS

All the graduate departments offer full-time programs on the co-operative plan. This plan requires two academic years and a summer. During this time, each student has three twelve-week quarters of academic work and four twelve-week quarters of professional employment. The staff of the department of Guidance and Placement of the Division of Co-operative Education will arrange for employment of co-operative graduate students. Applicants for this program must file two letters of recommendation and a copy of all prior college work as soon after January 15 as possible. The admissions committee will notify applicants as soon as their material is complete.

In some departments, all of the students start their academic work in the fall quarter and are classed as Division A students. Some departments have one group of students starting their academic work in the fall quarter and one group of students starting their academic work in the winter quarter. In this case, the first group of students is classed as Division A and the second group of students is classed as Division B. The relationship of the first academic quarter for students in the respective divisions and the fall, winter, and spring academic quarters is explained in the following chart:

**DIVISION A**

Academic Year	First Academic Quarter	Second Academic Quarter
First	Fall Quarter	Spring Quarter
Second	Winter Quarter	— — — —

**DIVISION B**

Academic Year	First Academic Quarter	Second Academic Quarter
First	Winter Quarter	— — — —
Second	Fall Quarter	Spring Quarter

**ASSISTANTSHIPS**

Some departments have assistantships, called graduate co-operative teaching assistantships, in which students alternate full-time academic work with full-time work in the department. Some departments also have available graduate co-operative research assistantships. Applications for fellowships must be filed by March 15, with two letters of recommendation and a transcript of all prior college work. Holders of fellowships must have their course program approved by the chairman of the respective department before the student registers in the Graduate Division Office.

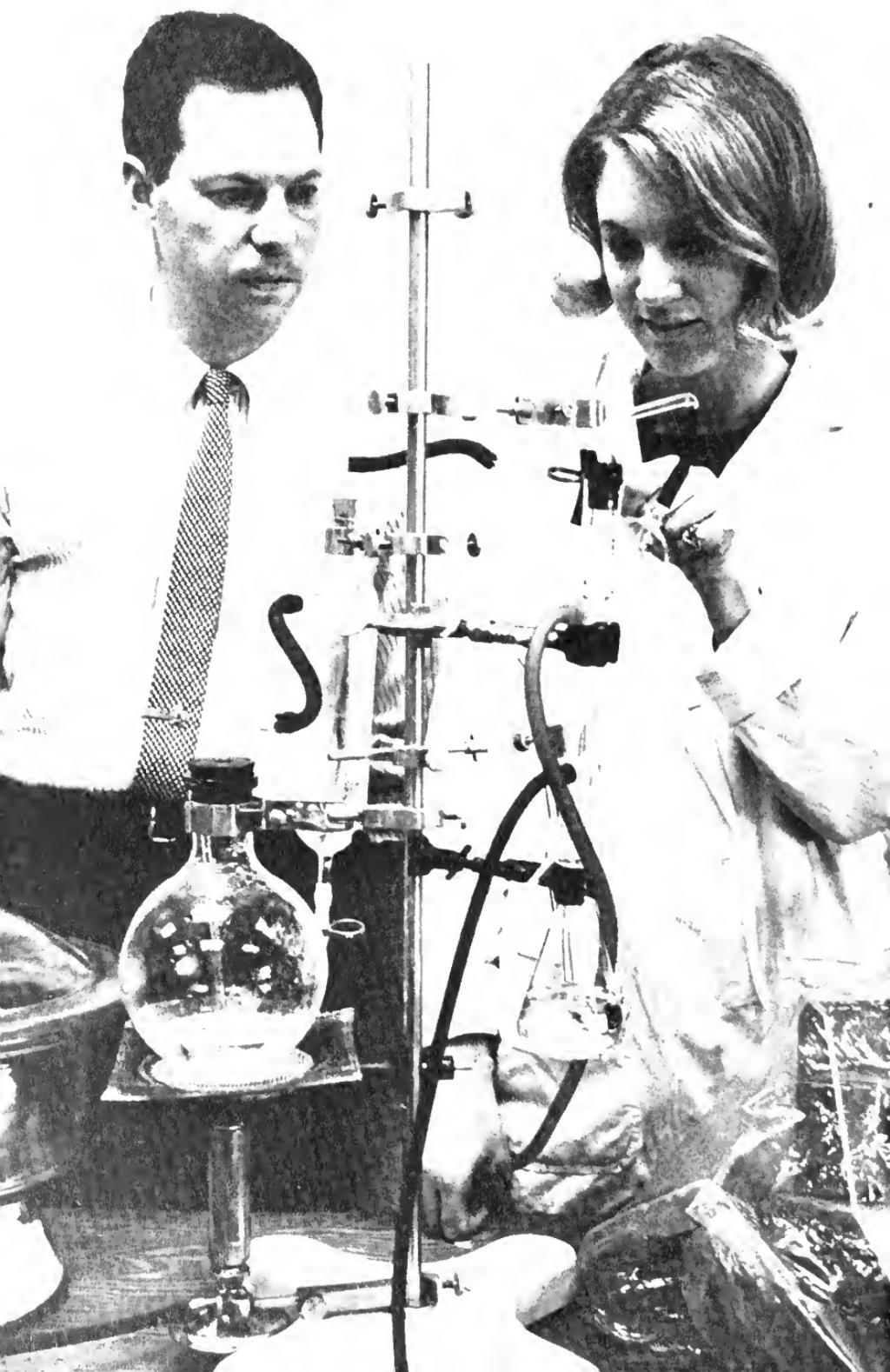
**PART-TIME EVENING PROGRAM**

Most of the departments offer part-time evening programs in which the admission requirements are the same as for full-time programs. However, the program is established in such a way that students may progress according to their abilities and the time available. The curricula of the part-time evening programs are specified by the departments. All part-time students must register in the Graduate Division Office and present a transcript of undergraduate record at that time.

**COMMITTEE ON GRADUATE STUDY  
IN  
ENGINEERING**

**for 1966-1967**

George W. Hankinson, A.B., S.B., M.S., Chairman	Assistant Dean of Engineering and Director of the Graduate School of Engineering and Professor of Civil Engineering
Arthur R. Foster, B.S., M.Eng.	Professor of Mechanical Engineering and Chairman of the Department
James M. Moore, B.S., M.S., Ph.D.	Professor of Industrial Engineering and Chairman of the Department
Harold R. Raemer, B.S., M.S., Ph.D.	Professor of Electrical Engineering and Chairman of the Department
Ronald E. Scott, B.A., M.A., Sc.D.	Dean of Engineering
Ernest L. Spencer, S.B., M.S.	Professor of Civil Engineering and Chairman of the Department
Ralph A. Troupe, B.S., M.S., Ph.D.	Professor of Chemical Engineering and Chairman of the Department
Arthur A. Vernon, S.B., M.S., Ph.D.	Dean of the Graduate Division
Alvah K. Borman, B.S., Ex Officio	Director of Graduate Placement Services and Professor of Co-Operative Education



## FACULTY

<b>Charles T. Ajamian</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Boston University; Ed.M., Tufts University	
<b>Jerome L. Altman</b>	<b>Lecturer in Engineering</b>
B.S., Massachusetts Institute of Technology; M.S., Northeastern University	
<b>Edward E. Altshuler</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University; M.S., Tufts University; Ph.D., Harvard University	
<b>Reginald L. Amory</b>	<b>Assistant Professor of Civil Engineering</b>
B.C.E., New York University; M.C.E., Clarkson College of Technology; Ph.D., Rensselaer Polytechnic Institute	
<b>Ralph E. Bach, Jr.</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., Lehigh University; M.S., Ph.D., Northeastern University	
<b>Michael S. Baram</b>	<b>Lecturer in Engineering</b>
B.S., Tufts University; LL.B., Columbia University	
<b>Melvin J. Barth</b>	<b>Lecturer in Engineering</b>
B.S., U.S. Naval Academy; M.S., U.S. Air Force Institute of Technology; Ph.D., Syracuse University	
<b>Robert E. Bayliss</b>	<b>Lecturer in Engineering</b>
A.B., Harvard University; M.B.A., Boston University	
<b>Murray D. Black</b>	<b>Lecturer in Engineering</b>
B.S., M.B.A., Northeastern University	
<b>Ralph S. Blanchard, Jr.</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., University of New Hampshire; M.S., Northeastern University	
<b>Bruno Brodfeld</b>	<b>Lecturer in Engineering</b>
B.S.C.E., Institute of Civil Engineering, Bucharest	
<b>Ronald Brown</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University	
<b>Gordon A. Bruggeman</b>	<b>Lecturer in Engineering</b>
S.B., Sc.D., Massachusetts Institute of Technology	
<b>John F. Buoncristiani</b>	<b>Assistant Professor of Industrial Engineering</b>
B.S., University of Rhode Island; M.S., Massachusetts Institute of Technology; Ph.D., Northwestern University	
<b>Allen C. Busch</b>	<b>Lecturer in Engineering</b>
B.A., M.A., Miami University	

<b>Leroy M. Cahoon</b>	<b>Associate Professor of Civil Engineering</b>
B.S., Dartmouth University; M.S., Northeastern University	
<b>Hans R. Camenzind</b>	<b>Lecturer in Engineering</b>
B.S., Institute of Technology, Zurich	
<b>Marcello J. Carrabes</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., M.S., Northeastern University	
<b>Sze-Hou Chang</b>	<b>Professor of Electrical Engineering</b>
B.S., Chiao Tung University; M.S., Ph.D., Harvard University	
<b>Stanley K. Chao</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Massachusetts Institute of Technology	
<b>Benjamin S. Clark</b>	<b>Lecturer in Engineering</b>
B.S., Boston University	
<b>John J. Cochrane</b>	<b>Assistant Professor of Civil Engineering</b>
B.S., Northeastern University; M.S., Ph.D., Rensselaer Polytechnic Institute	
<b>Basil L. Cochrun</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., Purdue University; M.S., Northeastern University	
<b>Bell A. Cogbill</b>	<b>Professor of Electrical Engineering</b>
B.S., M.S., University of Tennessee	
<b>Albert M. Colella</b>	<b>Lecturer in Engineering</b>
B.S., M.S., University of Rhode Island	
<b>Francis R. Collins</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University	
<b>William Connaughton, Jr.</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University; M.B.A., Boston College	
<b>John J. Cronin</b>	<b>Lecturer in Engineering</b>
B.S., Boston College; M.B.A., University of Pennsylvania	
<b>Donald S. Cunningham</b>	<b>Lecturer in Engineering</b>
S.B., Massachusetts Institute of Technology	
<b>Gordon F. Currin</b>	<b>Instructor in Electrical Engineering</b>
B.S., M.S., Northeastern University	
<b>Foster J. DeGiacomo</b>	<b>Lecturer in Engineering</b>
B.S., Boston University	
<b>Ladislav Dolansky</b>	<b>Professor of Electrical Engineering</b>
M.S., Massachusetts Institute of Technology; Ph.D., Harvard University	
<b>William R. Domey</b>	<b>Assistant Professor of Civil Engineering</b>
B.S., M.S., Northeastern University	

<b>Leonard R. Doyon</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University	
<b>John F. Dunn, Jr.</b>	<b>Professor of Mechanical Engineering</b>
S.B., S.M., Sc.D., Massachusetts Institute of Technology	
<b>Louis I. Egelson, Jr.</b>	<b>Lecturer in Engineering</b>
B.S., M.B.A., Harvard University	
<b>Victor Ellins</b>	<b>Lecturer in Engineering</b>
S.B., Massachusetts Institute of Technology; S.M., Northeastern University	
<b>Martin W. Essigmann</b>	<b>Dean of Research</b>
S.B., Tufts University; M.S., Massachusetts Institute of Technology	
<b>Frederick D. Ezekiel</b>	<b>Lecturer in Engineering</b>
B.S., S.M., Sc.D., Massachusetts Institute of Technology	
<b>Thomas A. Faulhaber</b>	<b>Lecturer in Engineering</b>
S.B., Massachusetts Institute of Technology; M.B.A., Harvard University	
<b>Willard R. Fey</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Ph.D., Massachusetts Institute of Technology	
<b>Melvin D. Field</b>	<b>Lecturer in Engineering</b>
B.S., New York University; M.S., Sc.D., Harvard University	
<b>Sepp Firnkas</b>	<b>Associate Professor of Civil Engineering</b>
Dipl. Ing., Technical University, Munich, Germany; C.E., Columbia University	
<b>Austin W. Fisher</b>	<b>Associate Professor of Engineering Management</b>
B.S., University of Massachusetts; Sc.D., Massachusetts Institute of Technology	
<b>Ralph E. Fleischmann</b>	<b>Lecturer in Engineering</b>
B.S., Rutgers University; M.S., New York University	
<b>Arthur R. Foster</b>	<b>Professor of Mechanical Engineering and Chairman of the Department</b>
B.S., Tufts University; M.E., Yale University	
<b>Bruce H. Frank</b>	<b>Lecturer in Engineering</b>
B.S., New York University; M.B.A., Boston University	
<b>Charles A. Furciniti</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University	
<b>Maurice Gertel</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University; M.S., University of Maryland	

<b>Walter A. Getchell, Jr.</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University	
<b>Gordon R. Gilbert</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Massachusetts Institute of Technology	
<b>Donald T. Goldberg</b>	<b>Lecturer in Engineering</b>
B.A., Tufts University; B.S., M.S., Massachusetts Institute of Technology	
<b>Robert A. Gonsalves</b>	<b>Assistant Professor of Electrical Engineering</b>
B.S., Tufts University; M.S., Ph.D., Northeastern University	
<b>Alvin S. Goodman</b>	<b>Associate Professor of Civil Engineering</b>
B.C.E., City College of New York; M.S., Columbia University; Ph.D., New York University	
<b>Bernard M. Goodwin</b>	<b>Associate Professor of Chemical Engineering</b>
B.S., Northeastern University; Sc.D., Massachusetts Institute of Technology	
<b>Paul F. Gorman</b>	<b>Lecturer in Engineering</b>
B.S., Worcester Polytechnic Institute; M.S., Northeastern University	
<b>Arvin Grabel</b>	<b>Assistant Professor of Electrical Engineering</b>
B.E.E., M.E.E., Sc.D., New York University	
<b>John D. Griffiths</b>	<b>Lecturer in Engineering</b>
S.B., Massachusetts Institute of Technology; M.E.E., Ph.D., Syracuse University	
<b>Herbert L. Groginsky</b>	<b>Lecturer in Engineering</b>
B.E.E., Polytechnic Institute of Brooklyn; M.S., Sc.D., Columbia University	
<b>Richard E. Grojean</b>	<b>Associate Professor of Physics</b>
B.S., Northeastern University; M.S., Tufts University	
<b>Frank E. Heart</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Massachusetts Institute of Technology	
<b>Sidney Herman</b>	<b>Associate Professor of Economics</b>
B.S., Northeastern University; M.A., Boston University	
<b>Mark L. Hinkle, Jr.</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Purdue University	
<b>Stewart V. Hoover</b>	<b>Assistant Professor of Industrial Engineering</b>
B.S., Rensselaer Polytechnic Institute; M.S., Northeastern University	

<b>L. Tin Htun</b>	<b>Lecturer in Engineering</b>
B.S., University of Rangoon; S.M., E.E., Massachusetts Institute of Technology	
<b>Thomas E. Hulbert</b>	<b>Associate Professor of Industrial Engineering</b>
B.M.E., Rensselaer Polytechnic Institute; M.S., Northeastern University	
<b>Walter E. Jaworski</b>	<b>Assistant Professor of Civil Engineering</b>
B.S., Northeastern University; M.S., Worcester Polytechnic Institute	
<b>Albert D. Johnson</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University; M.A., Ph.D., Boston University	
<b>Warren J. Keegan</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Kansas State University; M.B.A., Harvard University	
<b>Charles S. Keevil</b>	<b>Professor of Chemical Engineering</b>
S.B., S.M., Sc.D., Massachusetts Institute of Technology	
<b>Wayne Kellner</b>	<b>Assistant Professor of Electrical Engineering</b>
B.S., University of Connecticut; M.S., Sc.D., Massachusetts Institute of Technology	
<b>McKeen Kessel</b>	<b>Lecturer in Engineering</b>
B.S., University of Connecticut	
<b>James C. Kilbane</b>	<b>Lecturer in Engineering</b>
A.B., Harvard University	
<b>William F. King</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., M.S., Northeastern University	
<b>John J. Klein</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University	
<b>Kenneth H. Konkle</b>	<b>Lecturer in Engineering</b>
B.S., University of Cincinnati; M.S., Massachusetts Institute of Technology	
<b>Alan Kotok</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Massachusetts Institute of Technology	
<b>John D. R. Kramer, Jr.</b>	<b>Lecturer in Engineering</b>
B.S., University of Pennsylvania; S.M., Sc.D., Massachusetts Institute of Technology	
<b>Walter H. Ku</b>	<b>Lecturer in Engineering</b>
B.S., University of Pennsylvania; M.S., Ph.D., Polytechnic Institute of Brooklyn	

<b>Kenneth M. Leet</b>	<b>Visiting Associate Professor of Civil Engineering</b>
B.S., Drexel Institute of Technology; M.S., D.Sc., Massachusetts Institute of Technology	
<b>Joseph H. Lenney</b>	<b>Associate Professor of Civil Engineering</b>
B.S., M.S., Northeastern University	
<b>Walter H. Lob</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., M.S., Massachusetts Institute of Technology	
<b>Morton Loewenthal</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., Rensselaer Polytechnic Institute; Ph.D., Massachusetts Institute of Technology	
<b>Robert F. London</b>	<b>Lecturer in Engineering</b>
A.B., Indiana University; M.B.A., Boston University	
<b>Bertram S. Long</b>	<b>Associate Professor of Mechanical Engineering</b>
B.S., Northeastern University; M.S., University of Virginia	
<b>Frederick M. MacGregor, Jr.</b>	<b>Lecturer in Engineering</b>
B.S., Cornell University	
<b>Pasquale A. Marino</b>	<b>Associate Professor of Mechanical Engineering</b>
B.S., M.S., Northeastern University; Ph.D., University of Connecticut	
<b>Melvin Mark</b>	<b>Professor of Mechanical Engineering</b>
B.S., M.S., University of Minnesota; Sc.D., Harvard University	
<b>Frederick H. Martin</b>	<b>Lecturer in Engineering</b>
B.E.E., City College of New York; S.M., Sc.D., Massachusetts Institute of Technology	
<b>Robert N. Martin</b>	<b>Assistant Professor of Electrical Engineering</b>
B.S., M.S., Northeastern University	
<b>Robert E. Maurer</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University	
<b>Harold F. McAfee</b>	<b>Lecturer in Engineering</b>
B.S., Norwich University	
<b>John A. McElman</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University; Ph.D., Virginia Polytechnic Institute	
<b>Alan J. McLaughlin</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University	
<b>James E. McLaughlin</b>	<b>Lecturer in Engineering</b>
B.S., Pennsylvania State University; M.B.A., Boston University	

<b>John D. McLellan</b>	<b>Lecturer in Engineering</b>
B.A., University of Toronto	
<b>Robert L. Meserve</b>	<b>Associate Professor of Civil Engineering</b>
B.S., M.S., Northeastern University	
<b>Ernest E. Mills</b>	<b>Associate Professor of Mechanical Engineering</b>
B.S., M.S., Northeastern University	
<b>Harold K. Mintz</b>	<b>Lecturer in Engineering</b>
B.S., Tufts University; M.S., Boston University	
<b>James M. Moore</b>	<b>Professor of Industrial Engineering and Chairman of the Department</b>
B.S., Rensselaer Polytechnic Institute; M.S., Cornell University; Ph.D., Stanford University	
<b>Charles S. Morrill</b>	<b>Lecturer in Engineering</b>
B.S., Tufts University; M.A., Columbia University	
<b>Edmund A. Mroz</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University	
<b>James D. Murphy</b>	<b>Lecturer in Engineering</b>
B.S., Worcester Polytechnic Institute	
<b>Richard J. Murphy</b>	<b>Assistant Professor of Mechanical Engineering</b>
B.S., College of the Holy Cross; M.S., Ph.D., Massachusetts Institute of Technology	
<b>Saul Namyet</b>	<b>Associate Professor of Civil Engineering</b>
B.S., Massachusetts Institute of Technology	
<b>Warren G. Nelson</b>	<b>Associate Professor of Mechanical Engineering</b>
S.B., S.M., Sc.D., Massachusetts Institute of Technology	
<b>Albrecht J. Neumann</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Columbia University	
<b>David D. Nickerson</b>	<b>Lecturer in Engineering</b>
A.B., Bates College; M.B.A., Harvard University	
<b>Welville B. Nowak</b>	<b>Professor of Mechanical Engineering</b>
S.B., Ph.D., Massachusetts Institute of Technology	
<b>John J. O'Donnell</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University; Ph.D., Carnegie Institute of Tech- nology	
<b>Stephen J. O'Neil</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University; M.S., Harvard University	
<b>Justin C. Pahls</b>	<b>Lecturer in Engineering</b>
B.S., Rutgers University; M.S., Northeastern University	

<b>Alex C. Papaioannou</b>	<b>Lecturer in Engineering</b>
B.S., Worcester Polytechnic Institute; M.S., Northeastern University	
<b>Don Parker</b>	<b>Lecturer in Engineering</b>
B.E.S., Brigham Young University; M.S., Harvard University; Sc.D., Massachusetts Institute of Technology	
<b>Gerald S. Parker</b>	<b>Lecturer in Engineering</b>
B.S., Northeastern University; M.S., Harvard University	
<b>Lawrence L. Parker</b>	<b>Assistant Professor of Industrial Engineering</b>
B.A., Carleton College; M.A., M.B.A., University of California	
<b>Edward R. Pershe</b>	<b>Associate Professor of Civil Engineering</b>
B.S., Ph.D., University of Illinois; M.S., Massachusetts Institute of Technology	
<b>Thomas E. Phalen, Jr.</b>	<b>Associate Professor of Mechanical Engineering</b>
B.S., Northeastern University; M.S., Harvard University	
<b>C. Andrew Pretzer</b>	<b>Assistant Professor of Civil Engineering</b>
B.S.E., M.S., University of Michigan; Ph.D., Massachusetts Institute of Technology	
<b>Andrew Pytel</b>	<b>Assistant Professor of Mechanical Engineering</b>
B.S., M.S., Ph.D., Pennsylvania State University	
<b>Harold R. Raemer</b>	<b>Professor of Electrical Engineering and Chairman of the Department</b>
B.S., M.S., Ph.D., Northwestern University	
<b>Wilfred J. Remillard</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., Massachusetts Institute of Technology; M.S., University of Rhode Island; Ph.D., Harvard University	
<b>Charles A. Renton</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., London University; Ph.D., Oxford University	
<b>George O. Reynolds</b>	<b>Lecturer in Engineering</b>
B.S., M.S., University of New Hampshire	
<b>Howard H. Reynolds</b>	<b>Lecturer in Engineering</b>
A.B., Harvard University; Sc.D., Massachusetts Institute of Technology	
<b>Andrew S. Rinde</b>	<b>Lecturer in Engineering</b>
B.S., University of Rhode Island; M.S., Northeastern University	

<b>Gilles J. Rivet</b>	<b>Lecturer in Engineering</b>
B.S., Michigan College; M.S., Northeastern University	
<b>J. Spencer Rochefort</b>	<b>Professor of Electrical Engineering</b>
B.S., Northeastern University; M.S., Massachusetts Institute of Technology	
<b>Fred A. Rosenberg</b>	<b>Assistant Professor of Biology</b>
B.A., New York University; Ph.D., Rutgers University	
<b>Ronald A. Rubel</b>	<b>Lecturer in Engineering</b>
B.S., Columbia University	
<b>Irving Sacks</b>	<b>Lecturer in Engineering</b>
B.A., Brooklyn College; M.S., Carnegie Institute of Technology	
<b>Gerald D. Saks</b>	<b>Lecturer in Engineering</b>
B.M.E., Cornell University; M.B.A., Boston University	
<b>Sheldon S. Sandler</b>	<b>Associate Professor of Electrical Engineering</b>
B.S., Case Institute of Technology; M.S., Yale University; Ph.D., Harvard University	
<b>Martin Schetzen</b>	<b>Associate Professor of Electrical Engineering</b>
B.E.E., New York University; S.M., Sc.D., Massachusetts Institute of Technology	
<b>John K. Schindler</b>	<b>Lecturer in Engineering</b>
S.B., Massachusetts Institute of Technology; M.S., Ph.D., Purdue University	
<b>William J. Scott</b>	<b>Lecturer in Engineering</b>
B.S., Babson Institute; M.B.A., Northeastern University	
<b>Richard G. Seed</b>	<b>Lecturer in Engineering</b>
A.B., A.M., Ph.D., Harvard University	
<b>David A. Shnidman</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Massachusetts Institute of Technology; Ph.D., Harvard University	
<b>Sidney L. Smith</b>	<b>Lecturer in Engineering</b>
S.B., S.M., Ph.D., Massachusetts Institute of Technology	
<b>Ernest L. Spencer</b>	<b>Professor of Civil Engineering and Chairman of the Department</b>
B.S., Northeastern University; M.S., Harvard University	
<b>Richard R. Stewart</b>	<b>Associate Professor of Chemical Engineering</b>
B.S., M.S., Northeastern University; Ph.D., Clemson University	
<b>Robert C. Stiebel</b>	<b>Associate Professor of Civil Engineering</b>
B.S., Drexel Institute of Technology; M.S., Iowa State University	

<b>Robert D. Stuart</b>	<b>Professor of Electrical Engineering</b>
B.A., Christ's College; M.A., Ph.D., Cambridge University	
<b>Robert W. Stuart</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University; S.M., Harvard University	
<b>Raimundas Sukys</b>	<b>Research Associate in Electrical Engineering</b>
B.S., M.S., Northeastern University	
<b>Brian J. Thompson</b>	<b>Lecturer in Engineering</b>
B.S., Ph.D., University of Manchester	
<b>Ralph A. Troupe</b>	<b>Professor of Chemical Engineering and Chairman of the Department</b>
B.S., Drexel Institute of Technology; M.S., Virginia Polytechnic Institute; Ph.D., University of Texas	
<b>Kenneth E. Tiernan</b>	<b>Lecturer in Engineering</b>
B.E.E., Clarkson College of Technology; M.S., Massachusetts Institute of Technology	
<b>Nelson T. Tsao-Wu</b>	<b>Lecturer in Engineering</b>
B.S., University of London; M.S., Northeastern University	
<b>Claude F. Valle, Jr.</b>	<b>Lecturer in Engineering</b>
B.S., M.S., Northeastern University	
<b>Alexander Vanderburgh, Jr.</b>	<b>Lecturer in Engineering</b>
B.S., Massachusetts Institute of Technology; M.S., Northeastern University	
<b>George Wallis</b>	<b>Lecturer in Engineering</b>
M.S., Ph.D., Brown University	
<b>Adriaan Walther</b>	<b>Lecturer in Engineering</b>
Ph.D., University of Delft	
<b>John H. Wells</b>	<b>Lecturer in Engineering</b>
B.S., Worcester Polytechnic Institute	
<b>Lih-Jyh Weng</b>	<b>Research Associate in Electrical Engineering</b>
B.S., Cheng Kung University; M.S., Ph.D., Northeastern University	
<b>Raymond P. Wenig</b>	<b>Lecturer in Engineering</b>
B.S., Massachusetts Institute of Technology	
<b>Robert B. Wilcox</b>	<b>Lecturer in Engineering</b>
B.E., Nova Scotia Technical College; M.S., Massachusetts Institute of Technology	
<b>George H. Willett</b>	<b>Lecturer in Engineering</b>
B.S., M.B.A., University of Michigan	

**John A. Williams** Assistant Professor of Chemical Engineering  
B.S., Ph.D., Case Institute; M.S., University of Michigan

**Leslie E. Woods** Lecturer in Engineering  
University of Strasbourg

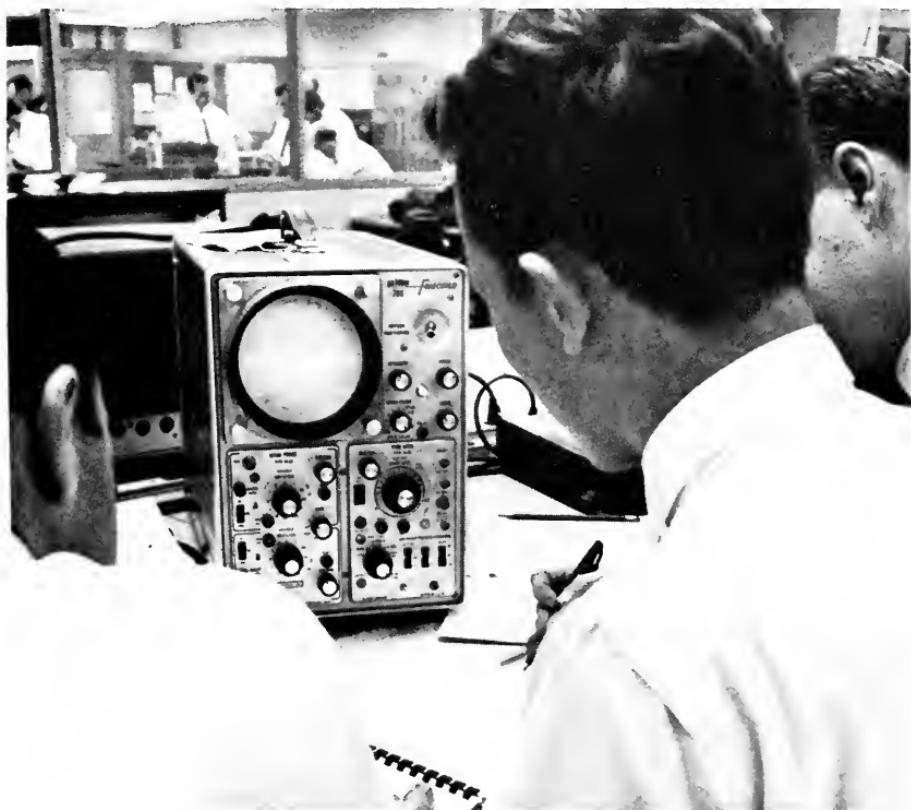
**John M. Woulbroun** Lecturer in Engineering  
B.S., M.S., Sc.D., Massachusetts Institute of Technology

**Alvin J. Yorra** Associate Professor of Mechanical Engineering  
B.S., Northeastern University; M.S., Massachusetts Institute of Technology

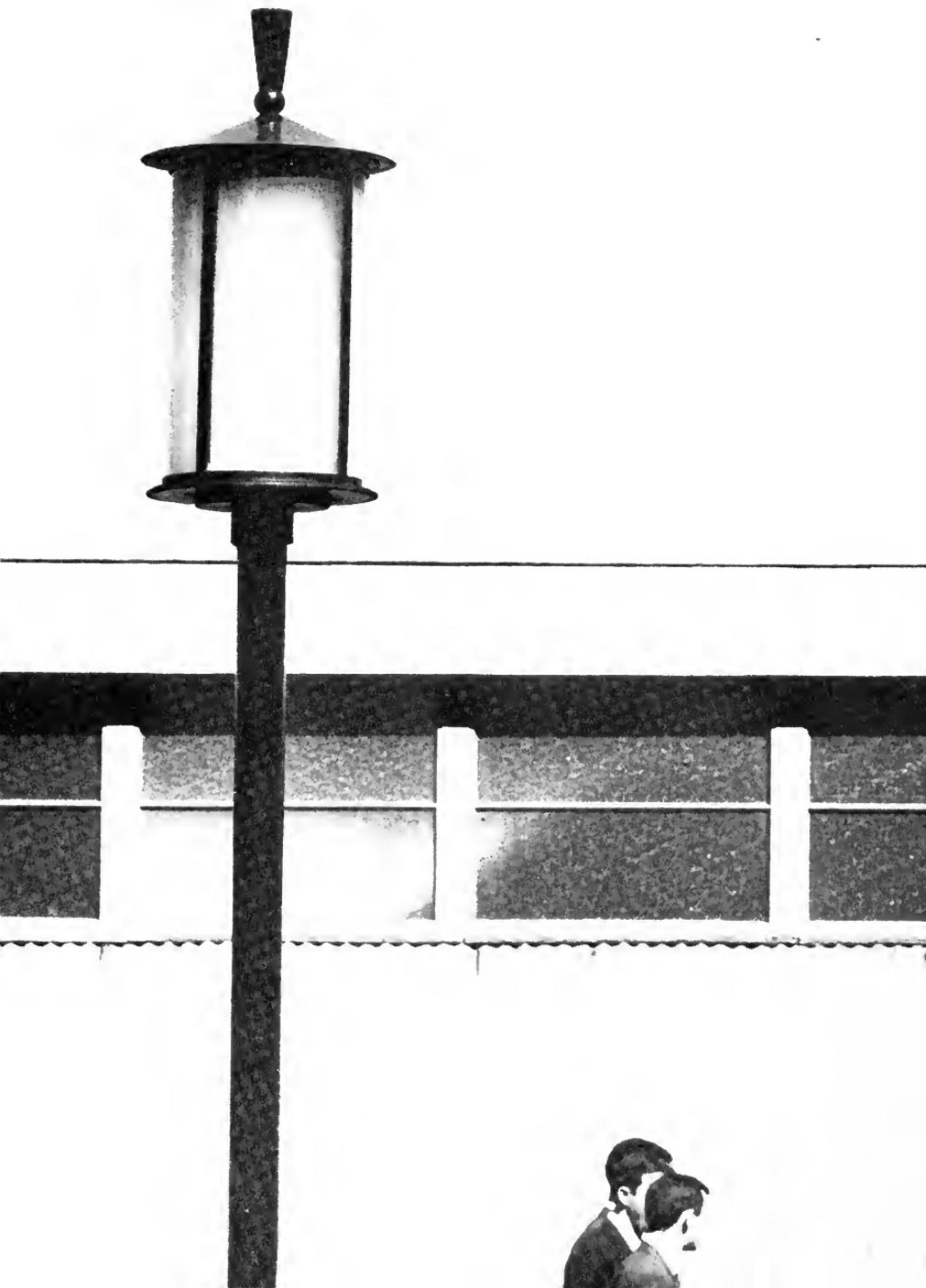
**Howard L. Yudkin** Lecturer in Engineering  
B.S., University of Pennsylvania; S.M., Ph.D., Massachusetts Institute of Technology

**Joseph J. Zelinski** Professor of Mechanical Engineering  
B.S., Ph.D., Pennsylvania State University

**John Zotos** Associate Professor of Mechanical Engineering  
B.S., Northeastern University; M.S., Massachusetts Institute of Technology



*Fields  
of  
Study*



# *Chemical Engineering*

## Admission

To be enrolled for graduate work in chemical engineering, applicants must have obtained a Bachelor of Science degree in Chemical Engineering from a recognized institution.

## THE MASTER'S DEGREE

### Full-Time Program on Co-operative Plan

Forty quarter hours of academic work are required. This program may be taken on a co-operative plan. On this plan, students take academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment.

The sequence of courses on the co-operative plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
4.802 Chemical Engineering		4.823 Transport Phenomena . . . . .	4
Mathematics . . . . .	4	4.833 Process Dynamics . . . . .	4
4.803 Optimization Techniques . . . . .	4	4.991 Thesis . . . . .	5
4.811 Chemical Engineering			
Thermodynamics . . .	4		
4.991 Thesis . . . . .	2		
	14		

Third Academic Quarter	Credits
4.890 Chemical Engineering	
Kinetics . . . . .	4
4.972 Heat Transfer and Fluid Mechanics . . .	4
4.991 Thesis . . . . .	5
	13

Students may also take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by the chairman of the department.

### **Electives**

With the approval of the chairman of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which give graduate work.

## **THE DOCTOR'S DEGREE**

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Chemical Engineering.

### **Admission**

Applicants who are enrolled as candidates for the degree of Master of Science in Chemical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Chemical Engineering for admission to the doctoral program. Such application must be made by April first of the year in which they expect to receive the Master's degree. The departmental graduate committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the Master's degree should write the chairman of the department for an application for an interview. This form, together with transcripts of all undergraduate and graduate work, must be transmitted to the chairman of the departmental graduate committee. The applicant will be notified of an interview time and, after the interview, will be advised if he should make formal application for admission to the doctoral program. Approved applicants must then submit an application for admission as a doctoral candidate and two letters of recommendation not later than May first. The applicant will then be notified of the acceptance of his application and the date of the qualifying examination.

### **Residence Requirement**

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the departmental graduate committee in order to give evidence that at least half of the time is being devoted to the requirements of the Graduate School program. In general, it should be expected that at least two years of full-time work after establishment of degree candidacy will be necessary.

### **Degree Candidacy**

Degree candidacy is established in accordance with the general Graduate Division regulations.

## **Qualifying Examination**

The qualifying examination includes a written and an oral part and is normally given in the spring and the fall. The written examination, in general, will cover the following areas:

1. General Principles in Chemical Engineering Science
2. Thermodynamics and Stoichiometry
3. Mathematical Procedures and Kinetics
4. Specialized Technological Topics (to be announced)

The oral examination will test general comprehension.

A student may take any or all of the examinations in each set, and may repeat a failed examination, only once, at a later offering. Taking of all examinations may not extend over a period greater than 13 months. Previously administered examinations will be available to formal applicants.

## **Comprehensive Examination**

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject-matter knowledge satisfactory for the award of the degree.

## **Course Requirements**

The course requirements in addition to the minimum requirement of forty quarter hours of credit for each student will be determined by the departmental graduate committee and the student in consultation with the committee. A minimum of 21 quarter hours of credit is required beyond the requirements for the Master's degree. A typical program might consist of the following:

- 6 credits electives either in Chemical Engineering or related fields
- 6 credits Mathematics
- 6 credits devoted to the field of specialization
- 3 credits seminar (1 credit per quarter for 3 quarters)

Although no fixed credits are assigned to the thesis, candidates will be required to devote time and effort to the thesis at least equal to that of the course work. Normally the thesis will require much more.

Transfer credit will be dealt with on an individual basis by the departmental graduate committee in accordance with the general Graduate Division regulations.

## **Thesis**

A thesis advisor will be appointed by the departmental graduate committee and the topic will be approved after consultation with the student, advisor, and graduate committee chairman. A proposal must then be submitted in writing to the thesis advisor who will obtain approval by the graduate committee chairman.

## **Foreign Language**

The foreign language requirement may be satisfied by a reading knowledge in two languages selected from French, German and Russian. The examinations are administered by the department and consist of translation from current scientific journals or textbooks.

**Final Oral Examination**

This examination is held in accordance with the general Graduate Division regulations.

**DESCRIPTION OF COURSES**

All courses carry four quarter hours of credit unless otherwise noted. Seminars and thesis may have varying credits established by the department at the time of registration.

**4.801 Advanced Chemical Engineering Calculations**

Prep. Bachelor of Science degree in Chemical Engineering, including Differential Equations

The study of complex material and energy balances is undertaken with the view to apply these to actual plant conditions.

**4.802 Chemical Engineering Mathematics**      Prep. 10.147 Mathematical Analysis or equivalent

Formulation and solution of problems involving advanced calculus as they arise in chemical engineering situations. Methods covered will include ordinary differential equations, series solutions, complex variables, Laplace transforms, partial differential equations, and matrix operations. Emphasis will be placed on methods for formulating the problems. It will be assumed that the student has been exposed to some of these topics in appropriate mathematics courses.

(Offered 1967-68, Fall quarter)

**4.803 Optimization Techniques**

Prep. Bachelor of Science degree in Chemical Engineering

The mathematical development of optimum seeking methods are presented with applications to chemical processing systems. The topics covered include direct search methods, Lagrange multipliers, the calculus of variations, linear programming, dynamic programming and the continuous maximum principle.

(Offered 1967-68, Fall quarter)

**4.811 Chemical Engineering Thermodynamics**

Prep. Undergraduate Chemical Engineering Thermodynamics

A thermodynamic analysis of processes of interest to the chemical engineer. Thermodynamics is used as a tool and a method of approach to the solution of industrial problems. Fundamental principles are reviewed to the extent needed.

(Offered 1967-68, Fall quarter)

**4.821 Corrosion Fundamentals**

Prep. Bachelor of Science degree

Economic factors, basic theories, types, behaviors of specific systems and protection against corrosion are studied. Wherever possible, engineering applications of the principles are emphasized.

(Offered 1967-68, Fall quarter, evening only. 2 Q.H. credits)

**4.823 Transport Phenomena**

Prep. Advanced Mathematics  
and Unit Operations or equivalent

A consideration of the relationships of mass, momentum, and energy transfer. Fundamental equations of change covering the transport of momentum, heat, and mass are developed to illustrate the essential unity of the transport processes. Molecular, microscopic, and macroscopic systems are studied. It will be seen that much of the theory behind the engineering calculations on which the unit operations of chemical engineering are based can be organized and integrated in terms of equations of change. (Offered 1967-68, Spring quarter)

**4.832 Chemical Data Estimation**

Prep. Bachelor of Science degree

Methods of obtaining physical and thermodynamic properties of chemical compounds and systems without resorting to laboratory investigations. Latest empirical relationships and physical and thermodynamic laws are introduced to obtain data for plant design and other chemical and engineering uses.

(Offered 1967-68, Winter quarter, evening only. 2 Q.H. credits)

**4.833 Process Dynamics**

Prep. Bachelor of Science degree in  
Chemical Engineering, including Differential Equations

The Laplace transform method is introduced. The representation of linear process systems by block diagrams, impulse response, frequency response and the transfer function are discussed. Feedback systems are analyzed using both the root-locus and Nyquist methods.

(Offered 1967-68, Spring quarter)

**4.890 Chemical Engineering Kinetics**

Prep. Thermodynamics,  
undergraduate Chemical Engineering Kinetics or equivalent

A review of the principles of reaction kinetics. Problems for solution similar to those encountered in the design and operation of reaction equipment are selected to illustrate important principles.

(Offered 1967-68, Winter quarter)

**4.899 Special Topics in Chemical Engineering**

Prep. Permission of  
Department staff

Topics of interest to the staff member conducting this class are presented for advanced study. A student may not take more than one Special Topics course with any one instructor.

(Offered 1967-68, all quarters)

**4.972 Heat Transfer and Fluid Mechanics**

Prep. Undergraduate  
courses in Heat Transfer and Fluid Mechanics

Development of the continuity momentum and energy relationships which govern the flow of real fluids. Application to situations of laminar and turbulent flow in closed conduits. Presentation of the boundary layer concepts in laminar flow situations. Extension of these ideas to the

turbulent case with discussion of the mixture length hypotheses and statistical theory. Discussion of the three mechanisms of heat transmission. Presentation of Fourier's law governing heat transfer by conduction with applications in steady-state and transients processes.

(Offered 1967-68, Winter quarter)

**4.990 Seminar**

Prep. Admission to graduate program in  
Chemical Engineering

Topics of an advanced nature are presented by staff, outside speakers  
and students in the graduate program. This course must be attended by  
all master's degree candidates.

(Offered 1967-68, all quarters)

**4.991 Thesis (Master's Degree)**

Prep. Admission to  
Master of Science Program in Chemical Engineering

Analytical and/or experimental work conducted under the supervision of  
the department. For master's degree requirement.

(Offered 1967-68, all quarters)

**4.995 Thesis (Ph.D. Degree)**

Prep. Admission to Doctoral  
Program in Chemical Engineering

Theoretical and experimental work conducted under the supervision of  
the department.

(Offered 1967-68, all quarters)



# Civil Engineering

## Admission

To be enrolled for graduate work leading to the degree of Master of Science in Civil Engineering, applicants must have obtained a Bachelor of Science degree in Civil Engineering from a recognized institution. Applicants with a Bachelor of Science degree from a recognized institution in some other engineering field or related science and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

## THE MASTER'S DEGREE

### Full-Time Program on Co-operative Plan

Forty quarter hours of academic work are required. This program may be taken on a co-operative plan. On this plan one group of students takes academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. Another group may take the academic work in the Winter quarter of the first year and in the Fall and Spring quarters of the second year. In either case, the other three quarters of the two academic years and the Summer after the first year are available for professional employment.

A thesis carrying eight (8) hours of credit may be elected with the approval of the department. In lieu of a thesis, special reports may be arranged with credit of two (2) quarter hours. Ordinarily, a thesis or report is required.

Options in Structural Engineering and Sanitary Engineering are available. The sequence of courses on a co-operative plan will normally be taken according to the following pattern:

## STRUCTURAL ENGINEERING

First Academic Quarter	Credits	Second Academic Quarter	Credits
1.847 Structural Analysis	4	1.856 Structural Analysis	4
1.877 Eng. Props. of Soils	4	1.858 Concrete Structures	4
1.894 Numerical Methods in Structural Mechanics .....	4	1.861 Design of Structures .....	2
10.804 Advanced Math . .	<u>2</u>	1.878 Foundation Eng. . .	<u>4</u>
			<u>14</u>

Third Academic Quarter	Credits
1.855 Concrete Structures	2
1.857 Structural Dynamics .....	4
1.864 Design of Structures .....	4
1.873 Soils Testing Lab. .	<u>2</u>
	<u>12</u>

Students may also take this program on a continuous full-time basis to complete the requirements in one academic year.

### Electives

With the approval of the chairman of the department, substitutions may be made for some of the prescribed courses by other courses in the department or in other departments which offer graduate work.

## SANITARY ENGINEERING

First Academic Quarter	Credits	Second Academic Quarter	Credits
1.914 Water & Waste Treatment .....	4	1.915 Water & Waste Treatment .....	4
1.923 Sanitary Chemistry .....	4	1.992 Special Topics .....	2
1.933 Sanitary Analysis .....	4	Electives .....	<u>8</u>
Electives .....	<u>2</u>		
	<u>14</u>		
Third Academic Quarter	Credits		
1.922 Sanitary Bacteriology .....	2		
1.992 Special Topics .....	2		
1.994 Seminar .....	2		
Electives .....	<u>6</u>		
	<u>12</u>		

Students may also take this program on a continuous full-time basis to complete the requirements in one academic year.

### Electives

The electives will normally be available according to the following schedule. Approved additional electives may be available from the graduate offerings in the departments of Chemistry, Biology, Chemical Engineering, and Industrial Engineering.

FALL QUARTER	SPRING QUARTER
1905 Water Resources ... 2	1907 Water Resources ... 4
**1.940 Public Health .... 2	*1.922 Sanit. Bact. .... 2
*1.954 Stream Sanit. .... 2	1.938 Sanit. Anal. .... 4
*1.960 Hydr. Strucs. .... 2	*1.950 Air Pollution .... 2
	*1.953 Sanit. Micro. .... 2
	*1.962 Hydr. Strucs. .... 2

\*Offered in evening program only

\*\*Offered in both day and evening program

**WINTER QUARTER**

1.904	Hydraulics . . . . .	4
**1.951	Rad. Health . . . . .	2
*1.952	Ind. Hygiene . . . . .	2
1.954	Stream Sanit. . . . .	2
*1.961	Hydr. Strucs. . . . .	2

**Evening Part-Time Programs**

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their ability to combine their study load with their employment load.

**REQUIRED COURSES**

Structural Engineering	Credits	Sanitary Engineering	Credits
1.841 Struc. Analysis . . .	2	1.910 Water & Waste	
1.842 Struc. Analysis . . .	2	Treat. . . . .	2
1.843 Struc. Analysis . . .	2	1.911 Water & Waste	
10.804 Adv. Mathematics .	<u>2</u>	Treat. . . . .	2
	<u>8</u>	1.912 Water & Waste	
		Treat. . . . .	2
		1.920 Sanit. Chemistry I .	2
		1.921 Sanit. Chemistry II .	2
		1.922 Sanitary Bacteriology . . . .	2
		1.930 Sanit. Analysis . . .	2
		1.931 Sanit. Analysis . . .	<u>2</u>
			<u>16</u>

**Electives**

Twenty-six quarter hours must be elected from Civil Engineering courses within the particular field of study (i.e. Structures) or 18 hours in Sanitary Engineering.

Six quarter hours may be elected from any courses in engineering or science for which the student has the necessary preparation.

A meaningful sequence of electives must be chosen which meets the approval of the department. Department interviews are necessary early in the program for both day and evening students in order that an approved program of electives may be arranged with the individual. For evening

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\*Offered in evening program only

\*\*Offered in both day and evening program

students it is suggested that only required courses be taken during the first quarter. During that quarter an interview should be scheduled within the department for preliminary planning of the remainder of the individual program.

## DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise noted.

<b>1.841 Structural Analysis I</b>	Prep. Differential and Integral Calculus plus Theory of Structures
Analysis of statically indeterminate structures by energy methods and classical methods including moment distribution. Applications will be made to planar and three-dimensional trusses.	
(Offered yearly, Fall quarter)	
<b>1.842 Structural Analysis II</b>	Prep. 1.841, Structural Analysis I
A continuation of 1.841 including applications to prismatic and non-prismatic beams, frames, and rings considering the effects of torsion, transverse shear, bending, temperature changes, support motions, and fabrication errors.	
(Offered yearly, Winter quarter)	
<b>1.843 Structural Analysis III</b>	Prep. 1.842, Structural Analysis II
Analysis of planar and three-dimensional structures by matrix methods.	
(Offered yearly, Spring quarter)	
<b>1.844 Structural Analysis IV</b>	Prep. 1.843, Structural Analysis III
Matrix methods of analysis for rigid frames. Stiffness and flexibility formulation will be presented.	
(Offered 1968-69, Fall quarter)	
<b>1.845 Structural Analysis V</b>	Prep. 1.844, Structural Analysis IV
Matrix methods of structural analysis are applied to discrete element idealizations of dams, plates, shells, folded plates and shear walls.	
(Offered 1968-69, Winter quarter)	
<b>1.846 Structural Analysis VI</b>	Prep. 1.845, Structural Analysis V
Matrix methods are applied to guyed towers, cable structures, and suspension bridges.	
(Offered 1968-69, Spring quarter)	
<b>1.847 Structural Analysis</b>	Prep. Differential and Integral Calculus plus Theory of Structures
This course, offered to day students, embodies the material in 1.841 and 1.842, Structural Analysis I and II.	
(Offered yearly, Fall and Winter quarters. 4 Q.H. credits)	

**1.849 Model Analysis**

Prep. Admission to Program and  
Approval of Instructor

Development of the principles of similitude to establish the relationship between behavior in the model and the full sized structure. Review of techniques to fabricate, to load and to instrument models. Application and use of strain gauges. The laboratory portion is devoted to model analysis of a complex structure. (Offered 1968-69, Spring quarter)

**1.850 Structural Dynamics I**

Prep. 1.843, Structural Analysis III

Analysis of structures subjected to dynamic loads by exact and approximate methods. (Offered 1968-69, Fall quarter)

**1.851 Structural Dynamics II**

Prep. 1.850, Structural Dynamics I

Continuation of 1.850 with application to the design of structures subjected to blast loads and seismic loadings. Other applications will include self-induced vibrations and moving loads on structures.

(Offered 1968-69, Winter quarter)

**1.852 Structural Dynamics III**

Prep. 1.851, Structural Dynamics II

The content of the course will vary with the interests of the students who elect to take it, subject to the approval of the instructor. Special topics may include elastic and inelastic stability of structures, plates and shells, and experimental structural analysis.

(Offered 1968-69, Spring quarter)

**1.853 Concrete Structures**

Prep. Reinforced Concrete Design

Behavior of Concrete under stress and strain. Analysis of modes of failures of concrete members in laboratory tests. A survey of failures of structures resulting from inadequate design and from major causes (earthquakes, accidents, fatigue). Lessons to be learned leading to the derivation for a "Force-Strain Theory" for the analysis of structural systems. Combining the basic analysis of all reinforced concrete, pre-stressed concrete (normal reinforced concrete with normal forces); two dimensional systems (plates, deep girders, walls); three dimensional structures (developable and non-developable surfaces) into a single "Force-Strain Theory" analysis. (Offered yearly, Fall quarter)

**1.854 Concrete Structures**

Prep. 1.853, Concrete Structures

Application of "Force-Strain Theory" to progressive design methods for continuous members (beams, girders, bridges), rigid frames (plant and utility structures, high rise office and apartment buildings and bridges). Analysis of three dimensional rigid frames for single and multi-story structures. Corresponding construction details, practical aspects of field operations connected with a particular design, and evaluation of materials most suitable structurally and economically to be used (strength and type of concrete, type of steel, normal reinforcing or prestressing).

(Offered yearly, Winter quarter)

**1.855 Concrete Structures** Prep. 1.854, Concrete Structures  
 Design of two dimensional bearing surfaces (plates, deep girders, walls), three dimensional systems (folded plates, shells of developable and non-developable surfaces). Analysis and design of tension and compression systems and derivation of structural systems based on principles of above analysis (hanging roof, suspension bridges and structures, use of compression rings, etc.). Future trends in design and analysis of concrete structures. (Offered yearly, Spring quarter)

**1.856 Structural Analysis** Prep. 1.847, Structural Analysis  
 This course, offered to day students, embodies the course content offered in 1.843, Structural Analysis III and 1.844, Structural Analysis IV.  
 (Offered yearly, Spring and Fall quarters. 4 Q.H. credits)

**1.857 Structural Dynamics** Prep. 1.856, Structural Analysis  
 This course, offered to day students, embodies the material in 1.850 and 1.851, Structural Dynamics 1 and 11.  
 (Offered yearly, Winter and Spring quarters. 4 Q.H. credits)

**1.858 Concrete Structures** Prep. Reinforced Concrete Design  
 This course, offered to day students, embodies the material in 1.853 and 1.854, Concrete Structures.  
 (Offered yearly, Spring and Fall quarters. 4 Q.H. credits)

**1.861 Design of Structures** Prep. 1.842, Structural Analysis I  
 An advanced course in elastic design in structural steel. Design problems involving braced and rigid frame structures subject to gravity, wind, and seismic loads are considered. (Offered yearly, Fall quarter)

**1.862 Design of Structures** Prep. 1.861, Design of Structures  
 An analysis and design course in structural steel in which the emphasis is on plastic behavior. Design problems involving plastic hinge location in frames and the design of rigid frames using AISC Specs, Section 2, are among the topics considered. (Offered yearly, Winter quarter)

**1.863 Design of Structures** Prep. 1.862, Design of Structures  
 Advanced problems in elastic and plastic design of structural steel. Use of high strength steels in building frames. A design project chosen by the student, with approval of the instructor, will be completed in this term.  
 (Offered yearly, Spring quarter)

**1.864 Design of Structures** Prep. 1.861, Design of Structures  
 This course, offered to day students, embodies the material in 1.862 and 1.863, Design of Structures.  
 (Offered yearly, Winter and Spring quarters. 4 Q.H. credits)

<b>1.871 Engineering Properties of Soils</b>	Prep. Undergraduate course in basic Soil Mechanics Review of phase relationships, soil consistency etc. permeability and capillarity; effective stress concept, analysis of seepage in porous media; stress distribution; introduction to settlement analysis. (Offered yearly, Fall quarter)
<b>1.872 Engineering Properties of Soils</b>	Prep. 1.871 Engineering Properties of Soils A continuation of course 1.871. The course covers consolidation theory and settlement analysis; shear strength properties of soils; stability analysis of open and braced cuts, and earth pressure theory and analysis. (Offered yearly, Winter quarter)
<b>1.873 Soils Testing Laboratory</b>	Prep. 1.871, Engineering Properties of Soils Classification tests are performed in conjunction with laboratory studies in compaction, permeability, consolidation and shear strength characteristics of fine and coarse grain soils. CBR and field density tests are also conducted. (Offered yearly, Spring quarter)
<b>1.874 Soil Mechanics and Foundation Engineering</b>	Prep. 1.872, Engineering Properties of Soils Review of important characteristics of granular and cohesive soils with respect to relative density and strength. Bearing capacity of soils — design of isolated and combined footings, raft and mat foundations. Deep foundations — caissons and piles. Load tests of above foundations, and interpretation of results. Practical aspects of foundations work in view of field conditions and economy. (Offered yearly, Fall quarter)
<b>1.875 Soil Mechanics and Foundation Engineering</b>	Prep. 1.874, Soil Mechanics and Foundation Engineering Stress and strain in soils. Principal stress relations in soil — pressure distribution theory — their limits and practical approach — Boussinesq's-Westergaard's-Froehlich's-Newmark's methods. Settlement calculations — based on laboratory test results and approximate methods — Time settlement relationship. Lateral earth pressure — design of retaining structures, such as crib walls, retaining walls, and bulkheads. Stability of slopes. (Offered yearly, Winter quarter)
<b>1.876 Soil Mechanics and Foundation Engineering</b>	Prep. 1.875, Soil Mechanics and Foundation Engineering Special topics in foundation engineering. Marine structures (piers, wharves, dolphins, off-shore structures) — cofferdams, vibroflotation, and stabilization of soils for foundations by use of chemicals and other means. (Offered yearly, Spring quarter)

**1.877 Engineering Properties of Soils** Prep. Undergraduate Course in basic Soil Mechanics  
 This course, offered to day students, embodies the material in 1.871 and 1.872, Engineering Properties of Soils.  
 (Offered yearly, Fall and Winter quarters. 4 Q.H. credits)

**1.878 Foundation Engineering** Prep. 1.877, Engineering Properties of Soils  
 This course, offered to day students, embodies the course content offered in 1.874 and 1.875, Soil Mechanics and Foundation Engineering.  
 (Offered yearly, Fall and Spring quarters. 4 Q.H. credits)

**1.880 Rheological Properties of Materials** Prep. Consent of Instructor  
 An introduction to fundamental concepts of stress, strain, and strain rate as applied to engineering materials exhibiting the viscoelastic phenomena of creep and stress relaxation. Investigations of physical mechanisms responsible for such behavior.  
 (Offered yearly, Winter quarter)

**1.891 Computer Methodology** Prep. Admission to Engineering Graduate School  
 An introduction to the principles and techniques of application of electronic digital computers to the solution of Civil Engineering problems. Classification of problems and discussion of the available methods of analysis. Logic and philosophy of programming problems inherent in analysis, design and experimental research. Students will develop finished programs for the CDC 3300 in FORTRAN language.  
 (Offered 1967-68, Fall quarter)

**1.892 Numerical Methods in Structural Mechanics** Prep. Admission to Engineering Graduate School  
 Formulation and numerical solution of Civil Engineering problems in structural mechanics. Emphasis will be on lumped parameter systems. Equilibrium, eigenvalue, and propagation type problems will be covered. The CDC 3300 will be used.  
 (Offered 1967-68, Winter quarter)

**1.893 Numerical Methods in Structural Mechanics** Prep. 1.892, Numerical Methods in Structural Mechanics  
 Continuation of 1.892 with special emphasis on statistical methods of analysis and data reduction.  
 (Offered 1967-68, Spring quarter)

**1.894 Numerical Methods in Structural Mechanics**  
 Offered to day students and covers topics contained in 1.892 and 1.893.  
 (Offered yearly, Fall and Winter quarters. 4 Q.H. credits)

**1.898 Special Topics in Structural Engineering** Prep. Admission to Engineering Graduate School  
 An individual effort in an area selected by student and advisor resulting in a definitive report. Open to day students only.  
 (Offered yearly, all quarters. 2 Q.H. credits)

**1.901 Hydraulics** Prep. Undergraduate course in Hydraulics  
 Mechanical properties of fluids, continuity, Euler and Bernoulli equations, linear and angular momentum, forced acceleration, general energy equation, steady flow in conduits under pressure, compound pipe systems and networks. (Offered yearly, Fall quarter)

**1.902 Hydraulics** Prep. 1.901, Hydraulics  
 Velocity potential function and stream function; flow nets; dimensional analysis; skin friction, drag and lift, introduction to boundary layer theory; cavitation; water hammer. (Offered yearly, Winter quarter)

**1.903 Hydraulics** Prep. 1.902, Hydraulics  
 Open channel flow-uniform flow, local phenomena, surface curves, integration of varied flow function; hydraulic design of spillways, stilling basins, and transitions; hydraulic models. (Offered yearly, Spring quarter)

**1.904 Hydraulics** Prep. Undergraduate course in Hydraulics  
 This course offered to day students, embodies substantially the material in 1.902 and 1.903, Hydraulics.  
 (Offered yearly, Winter and Spring quarters. 4 Q.H. credits)

**1.905 Water Resources Planning I** Prep. Admission to Engineering Graduate School  
 Meteorological principles. Hydrologic cycle. Statistical and other analysis of precipitation and runoff. Precipitation studies cover adjustment of data; areal distribution; probable maximum precipitation; depth-area-duration, intensity-duration, rainfall frequency relationships. Runoff studies cover adjustment of data; peak flows; rainfall-runoff relationships; drainage basin characteristics; streamflow characteristics; unit hydrographs. (Offered yearly, Fall quarter)

**1.906 Water Resources Planning II** Prep. 1.905, Water Resources Planning I  
 Reservoir flood routing. Drainage design. Mass curve analyses. Reservoir operation. Duration curves. Ground water hydrology. Studies of erosion, sedimentation, temperature, and snow melt.  
 (Offered yearly, Winter quarter)

**1.907 Water Resources Planning III** Prep. 1.906, Water Resources Planning II  
 Applications of statistics, mathematical models, and high-speed computers to hydrologic analyses and other water resources planning problems; legal aspects of water utilization and control; multiple-purpose and multiple-unit systems; benefit-cost analyses; technical and economic feasibility studies. (Offered yearly, Spring quarter)

**1.909 Water Resources**

Prep. Admission to

Engineering Graduate School

This course, offered to day students, embodies the material in 1.906 and 1.907, Water Resources Planning II and III.

(Offered yearly, Spring and Fall quarters. 4 Q.H. credits)

**1.910 Water and Waste Treatment**

Prep. Admission to

Engineering Graduate School

Water usage, water quality, the theory and practice of water treatment, and the basic design of water supply and treatment works are presented including intake facilities, wells, filtration, coagulation, sedimentation, softening, iron and manganese removal, disinfection and fluoridation.

(Offered yearly, Fall quarter)

**1.911 Water and Waste Treatment**

Prep. 1.910, Water and

Waste Treatment

The theory and practice of sewage treatment and disposal; the basic design of primary and secondary treatment works, including screening, grit removal, sedimentation, biological stabilization processes, sludge digestion, waste stabilization ponds and disinfection. Advanced waste treatment methodology is also discussed.

(Offered yearly, Winter quarter)

**1.912 Water and Waste Treatment**

Prep. 1.911, Water and

Waste Treatment

Special applications in water and waste treatment including corrosion control, disinfection, pumping and storage facilities, application of chemicals, and salt water conversion. Emergency installations for both water supply and waste disposal. Instrumentation and automatic controls.

(Offered yearly, Spring quarter)

**1.913 Industrial Waste Disposal**

Prep. 1.921, Sanitary Chemistry II

A study of various manufacturing processes and their waste problems, together with methods of utilization, treatment, and disposal of their waste products. Specific processes that can be adapted to specific waste and their necessary concomitant structures are studied with the viewpoint of designing suitable treatment plants.

(Offered yearly, Fall quarter)

**1.914 Water and Waste Treatment**

Prep. Two undergraduate

semesters of Hydraulics

This course, offered to day students, embodies the material in 1.910 and 1.911, Water and Waste Treatment.

(Offered yearly, Fall and Winter quarters. 4 Q.H. credits)

**1.915 Water and Waste Treatment**Prep. 1.914, Water  
and Waste Treatment

This course, offered to day students, embodies the material in 1.912, Water and Waste Treatment, and 1.913, Industrial Waste Disposal.

(Offered yearly, Spring and Fall quarters. 4 Q.H. credits)

**1.920 Sanitary Chemistry I**Prep. Two semesters of  
General Chemistry

Analytical chemistry principles are studied with reference to sanitary engineering applications. The chemistry of processes such as coagulation, iron and manganese removal, ion exchange, softening and disinfection are included. The principles of spectroscopy and polarography are also discussed.

(Offered yearly, Fall quarter)

**1.921 Sanitary Chemistry II**

Prep. 1.920, Sanitary Chemistry I

A continuation of 1.920 including gas transfer, oxidation and reduction, and radiation chemistry. Reaction rates with reference to sanitary engineering applications such as BOD are discussed. Topics in organic chemistry and instrumental analysis are included.

(Offered yearly, Winter quarter)

**1.922 Sanitary Bacteriology**

Prep. 1.921, Sanitary Chemistry II

A study of bacteriology with emphasis on sanitary engineering applications. The course includes cell structure, nutrition, morphology, growth, reproduction and metabolism of bacteria. Effects of environmental factors including inhibition, killing and natural habitats are discussed. Methods of quantitative bacteriology are also covered.

(Offered yearly, Spring quarter)

**1.923 Sanitary Chemistry**

Prep. Two semesters of General Chemistry

Offered to day students and covers the topics contained in 1.920, Sanitary Chemistry I and 1.921, Sanitary Chemistry II.

(Offered yearly, Fall and Winter quarters. 4 Q.H. credits)

**1.930 Sanitary Analysis**

Prep. 1.921, Sanitary Chemistry II

A laboratory course in which routine analyses of water, sewage and industrial wastes are performed. Samples are analyzed qualitatively and quantitatively for physical and chemical properties. Laboratory analysis is performed in conjunction with various unit operations of water and sewage treatment such as iron and manganese removal, coagulation and sedimentation, water softening, disinfection, odor and color removal, and corrosion control. Standard methods of the American Public Health Association, along with other up-to-date methods of analysis utilizing colorimetry and spectrophotometry are employed. Interpretation of results in sanitary reports is emphasized.

(Offered yearly, Fall quarter)

<b>1.931 Sanitary Analysis</b>	Prep. 1.930, Sanitary Analysis The laboratory analyses of water, sewage and industrial wastes are continued. Investigation is made of biological waste treatment methods, including both chemical and biological analysis. Fresh water algae and other organisms are observed by microscopy. Bacteriological analyses, including membrane filter technique, are performed. Emphasis on sanitary reports is continued.
	(Offered yearly, Winter quarter)
<b>1.933 Sanitary Analysis</b>	Prep. 1.923, Sanitary Chemistry taken simultaneously This course, offered to day students, embodies the material in 1.930 and 1.931, Sanitary Analysis.
	(Offered yearly, Fall and Winter quarters. 4 Q.H. credits)
<b>1.935 Sanitary Laboratory — Unit Operations</b>	Prep. 1.931, Sanitary Analysis Laboratory-scale unit operations and processes in water and waste treatment are developed. Coagulation and sedimentation, filtration, softening, taste and odor control, disinfection, iron and manganese removal, and corrosion control are included. Reports are required selecting best suited treatment processes.
	(Offered yearly, Winter quarter)
<b>1.936 Sanitary Laboratory — Unit Operations</b>	Prep. 1.935, Sanitary Laboratory — Unit Operations Laboratory-scale unit operations and processes in water and waste treatment are continued. Activated sludge, trickling filter, photosynthetic processes, vacuum filtration, sludge digestion, gas utilization and production are considered. Reports selecting treatment processes continue to be emphasized.
	(Offered yearly, Spring quarter)
<b>1.938 Sanitary Analysis</b>	Prep. 1.933, Sanitary Analysis This course, offered to day students, embodies the material in 1.935 and 1.936 Sanitary Laboratory.
	(Offered yearly, Spring and Fall quarters. 4 Q.H. credits)
<b>1.940 Public Health Engineering Survey</b>	Prep. Admission to Engineering Graduate School An historical survey of public health conditions is used to introduce the student to the modern approach to public health engineering problems. Applications of engineering principles to such problems as garbage and refuse disposal, control of insect-borne diseases, milk and food sanitation, rodent control, camp and recreational sanitation, housing, control of atmospheric pollution, and radiological health are considered.
	(Offered yearly, Fall quarter)

**1.950 Air Pollution**

Prep. Admission to

Engineering Graduate School

Theory and practice related to engineering management of air resources, control of gaseous emission, investigation and study of air pollution, sampling and analysis methods. (Offered yearly, Spring quarter)

**1.951 Radiological Health Engineering**

Prep. Admission to

Engineering Graduate School

Types and sources of radioactive wastes, methods of handling, storage, and disposition of solid, liquid and gaseous radioactive wastes. Regulatory agency requirements. (Offered 1967-68, Winter quarter)

**1.952 Industrial Hygiene**

Prep. Admission to

Engineering Graduate School

Factors in the industrial environment that adversely affect the health, comfort and efficiency of the worker. Industrial surveys, and application of engineering principles to control of dust, toxic metals, gases and vapors, organic compounds, radiation, pressure, temperature and humidity. (Offered 1968-69, Winter quarter)

**1.953 Sanitary Microbiology**

Prep. 1.922, Sanitary Bacteriology

An advanced course in microbiology studying microorganisms found in water, soil, milk, and food, including fresh water algae. Applied microbiology is discussed concerning taste and odor organisms, trickling filters, activated sludge, digesters, lagoons and composting.

(Offered yearly, Spring quarter)

**1.954 Stream Sanitation**

Prep. 1.920, Sanitary Chemistry I

The basic principles of stream sanitation and corrective control methods. The topics taken up in this course include the following: aerobic and anaerobic decomposition, oxygen balance, carbon dioxide, oxidation, reduction, bacterial pollution, industrial pollution, water supply, shellfish, fish life, riparian rights, recreation and general stream sanitation. (Offered yearly, Fall quarter)

**1.960 Hydraulic Structures I**

Prep. Undergraduate course in Hydraulics

Dams and associated structures. Design criteria and preliminary analyses for gravity, arch, buttress, rock-fill and earth-fill dams. Foundation treatment and scour protection. Spillway structures. Gates. Navigation requirements of large rivers. Fishways. (Offered 1967-68, Fall quarter)

**1.961 Hydraulic Structures II**

Prep. Undergraduate course in Hydraulics

Intake structures in reservoirs and on rivers. Tunnels and pipe lines: design criteria and structural analyses; economic studies for diameter selection. Penstocks and anchor blocks. Canals: seepage and erosion; linings; canal structures. (Offered 1967-68, Winter quarter)

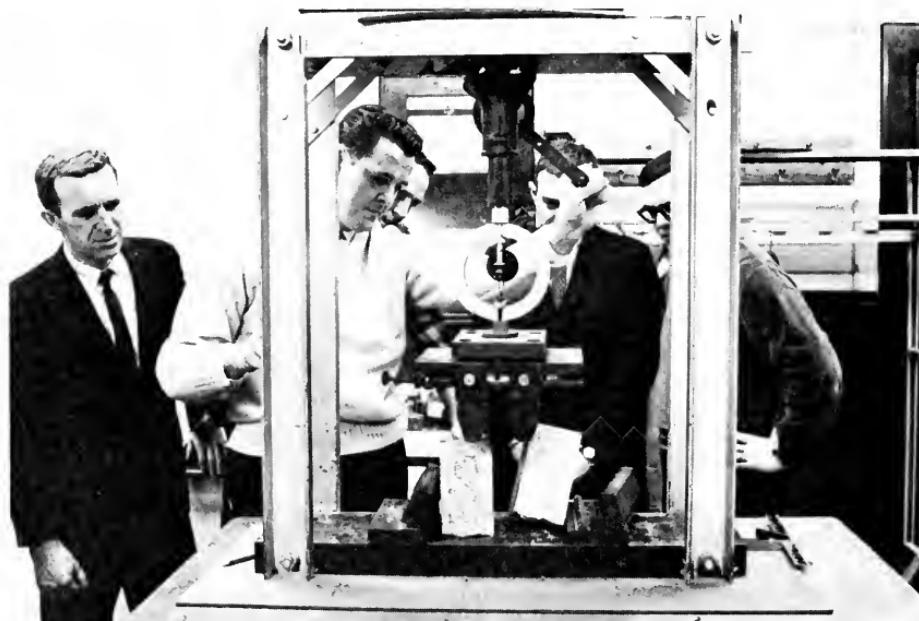
**1.962 Hydraulic Structures III** Prep. Undergraduate course in Hydraulics  
 Surge tanks; selection of type. River regulation; design principles; flood protection and navigation requirements; bank revetments, groins, dikes, and levees. Cofferdams. Operation and maintenance of hydraulic structures.  
 (Offered 1967-68, Spring quarter)

**1.991 Thesis (Master's Degree)** Prep. Admission to Engineering Graduate School  
 Analytical and/or experimental work conducted by arrangement with and under the supervision of the department.  
 (Offered yearly, all quarters. 8 Q.H. credits)

**1.992 Special Topics in Sanitary Engineering** Prep. Admission to Engineering Graduate School  
 An individual effort in an area selected by student and advisor resulting in a definitive report.  
 (Offered yearly, all quarters. 2 Q.H. credits)

**1.994 Seminar — Environmental Engineering** Prep. Admission to Engineering Graduate School  
 Discussions by professional engineers and scientists, faculty and graduate students on subjects within the area of Environmental Engineering. Open to day students only.  
 (Offered yearly, Winter quarter)

**1.996 Seminar — Environmental Health** Prep. Admission to Engineering Graduate School  
 Discussion by professional people in the Public Health field, faculty and graduate students on subjects within the area of Environmental Health. Open to day students only.  
 (Offered yearly, Spring quarter)



# *Electrical Engineering*

## Admission

To be enrolled for graduate work leading to the degree of Master of Science in Electrical Engineering, applicants must have obtained a Bachelor of Science degree in Electrical Engineering from a recognized institution. Applicants with a bachelor's degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

## THE MASTER'S DEGREE

### Full-Time Program on Co-operative Plan

Forty quarter hours of academic work are required. This program may be taken on a co-operative plan. On this plan one group of students takes academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. Another group may take the academic work in the Winter quarter of the first year and in the Fall and Spring quarters of the second year. In either case, the other three quarters of the two academic years and the Summer after the first year are available for professional employment.

The sequence of courses on the co-operative plan will normally be taken according to the following pattern:

First Academic Quarter	Credits	Second Academic Quarter	Credits
3.827 Transients in Linear Systems .....	4	3.800 Applied Electron and Ion Physics ...	2
3.980 Seminar I .....	2	3.832 Linear Circuit Theory I .....	4
10.806 Advanced Mathe- matics .....	4	10.831 Probability ...	2
Elective .....	<u>4 or 6</u>	Elective .....	<u>4 or 6</u>
	<u>14 or 16</u>		<u>12 or 14</u>
Third Academic Quarter	Credits		
3.842 Linear Active Circuits .....	4		
3.877 Electro- magnetic Theory .....	4		
3.981 Seminar II .....	2		
Elective .....	<u>4 or 6</u>		
	<u>14 or 16</u>		

A limited amount of work may be elected from the evening part-time program.

A thesis for six quarter hours credit is elective with the approval of the chairman of the department. If the thesis option is approved, this work is done in the second year of the program. Details concerning thesis proposals, editorial format, and time schedules are available at the Graduate Division Office.

The program of each student will be made up from the required and elective courses available in each term and approved by the student's academic advisor.

### **Electives**

The electives will normally be available according to the following schedule:

#### **Fall Quarter**

- 3.800 Applied Electron and Ion Physics
- 3.902 Communication Theory — Introduction
- 3.959 Control Systems I (Analysis and Synthesis)
- 3.970 Digital Computer Programming and Applications I

#### **Winter Quarter**

- 3.838 Nonlinear Circuit Analysis
- 3.852 Semi-Conductor Electronics

(Additional electives will be available from the later-afternoon portion of the evening program.)

#### **Spring Quarter**

- 3.801 Applied Electron and Ion Physics II
- 3.905 Communication Theory — Information Theory and Coding
- 3.962 Control Systems II (Non-Linear and Stochastic Systems)
- 3.972 Digital Computer Engineering I

#### **Full-Time Program**

For those students whose programs would be better served by full-time study the prescribed courses may be taken in one academic year. The sequence of the required courses will be different from the full-time program on the co-operative plan.

## THE DOCTOR'S DEGREE

### Full-Time Program

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information applicants should write to the Chairman of the Department of Electrical Engineering.

#### **Admission**

Students who have completed forty quarter hours of graduate work with a satisfactory record should apply for an interview with a departmental staff member designated by the Electrical Engineering Departmental Graduate Committee. The application form for this appointment may be obtained from the Graduate Division Office. This application, together with transcripts of all prior work and two letters of recommendation, should be forwarded to the Electrical Engineering Doctoral Committee no later than March 1st. After examination of this material an applicant will be notified of the time of this appointment for an interview. Based upon the interview, successful applicants must file a formal application for admission to the doctoral program. The applicant will then be notified concerning the time at which the qualifying examination must be taken.

#### **Residence Requirement**

The residence requirement is satisfied by one year of full-time graduate work or two consecutive years of part-time graduate work. In the latter case, a detailed time schedule must be approved by the student's advisor in order to give evidence that at least half of the time is being devoted to the requirements of the Graduate Division program.

#### **Degree Candidacy**

Degree candidacy is established in accordance with the general Graduate Division regulations.

#### **Qualifying Examination**

The qualifying examination is composed of a written and an oral part. The written part covers the following material: electric circuits and servo-mechanisms, distributed circuits and electromagnetic fields, physics, and mathematics. The oral examination is designed to test general comprehension. These examinations are normally taken after successful completion of forty quarter hours of graduate work and are held on Monday, Tuesday, and Wednesday of the week before the opening of the Fall quarter. If any part of the examination is failed, the entire examination may be repeated with permission of the department.

### Comprehensive Examination

During the time in which a student is a candidate for a doctoral degree he may be required to demonstrate by means of a comprehensive examination a subject matter knowledge satisfactory for the award of the degree.

### Course Requirements

The course requirements, in addition to the minimum requirement of forty quarter hours, are established by the department graduate committee for each candidate except for courses 3.983 and 3.984 which are required of all candidates.

### Thesis

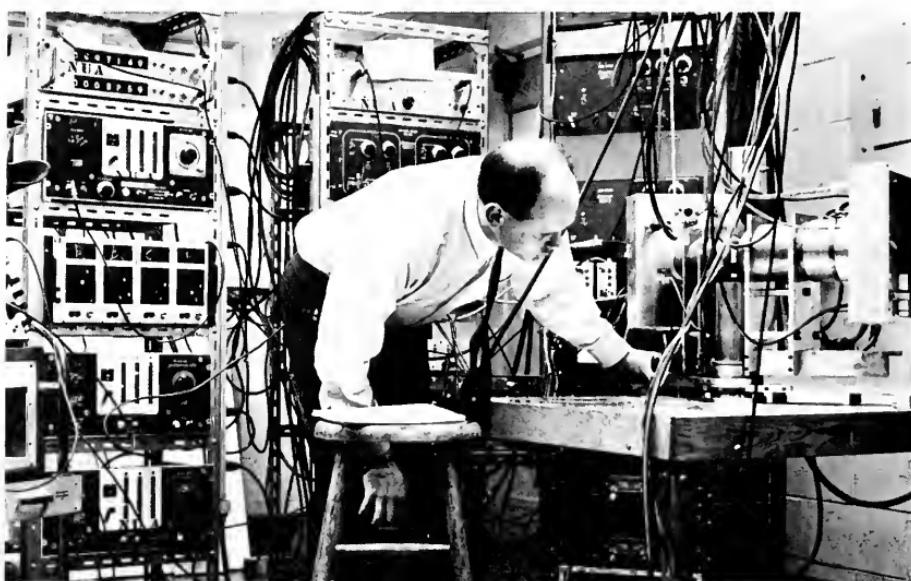
In some cases, arrangements for a thesis advisor may have been established before the completion of the qualifying examinations. In any case, such arrangements must be made as soon as possible after degree candidacy has been established. Depending upon the nature of a project, a thesis committee may be appointed by the chairman of the department. This committee will be kept informed of the progress of the thesis and will approve the thesis in its final form.

### Foreign Language

The foreign language requirement may be satisfied in French, German, or Russian. This examination will be administered by the departmental graduate committee and will consist of the translation of passages selected from current scientific journals or textbooks.

### Final Oral Examination

This examination will be held in accordance with the general Graduate Division regulations.



**THE MASTER'S DEGREE****Part-Time Evening Program****Electrical Engineering****Admission**

The admission requirements for the part-time evening program leading to the degree of Master of Science in Electrical Engineering are the same as for the full-time program, but students may progress according to their abilities and the time available.

All graduate courses presuppose mastery of the subject matter of a modern, fully accredited curriculum in electrical engineering. Applicants who have not taken further academic work for some time since they received their bachelor's degree may be required to take graduate courses to satisfy any deficiencies. For this purpose, the following courses are available:

<b>Credits</b>		
3.975	Precis of Modern Electrical Engineering I .....	2
3.976	Precis of Modern Electrical Engineering II .....	2
3.977	Precis of Modern Electrical Engineering III .....	2
10.801	Advanced Mathematics .....	2
10.802	Advanced Mathematics .....	2

These courses carry graduate credit but a maximum of four quarter hours of credit from this group may be used as elective credit in the degree program.

**Program**

To a substantial extent, the program of study is an elective one. The student is expected to select a well-balanced group of courses emphasizing one or two aspects of electrical engineering. Forty quarter hours of academic work are required for the master's degree of which eight quarter hours of credit are specified as follows:

<b>Required Courses</b>		<b>Credits</b>
3.825	Transients in Linear Systems A .....	2
3.826	Transients in Linear Systems B .....	2
10.804	Advanced Mathematics .....	2
10.805	Advanced Mathematics .....	2
		<u>8</u>

### **Electives**

Thirty-two quarter hours of credit are elective. Twenty quarter hours of credit must be chosen from the Electrical Engineering Department.

A maximum of 12 quarter hours of credit may be selected from graduate courses in sciences or other engineering departments for which the student has the necessary preparation. However, any such course should be taken in the major department concerned with the subject matter. For example, a course largely involving mathematical techniques should be taken in the Mathematics Department.

### **Quarter-Sequence Courses**

Certain courses have an A or B after the course title. In these cases, credit will be given towards the degree only if both the A and B courses are successfully completed.

### **Electro-Optics (Modern Optics) Program**

The Electro-Optics Program is a new program structured to provide the engineer or scientist with a strong background in modern optics.

### **Admission**

To be enrolled for this degree program, applicants must have a bachelor's degree in electrical engineering or physics from a recognized institution.

### **Program**

Forty quarter-hours of academic work are required, of which thirty are specified as follows:

	Courses	Credits
10.804	Advanced Mathematics .....	2
10.805	Advanced Mathematics .....	2
*11.801	Introductory Modern Physics .....	2
3.900	Communication Theory .....	2
3.901	Communication Theory .....	2
3.915	Geometric Optics .....	2
3.916	Physical Optics .....	2
3.917	Advanced Optics .....	2

(continued on page 83)

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\*(Persons with degrees in Physics may substitute 3.975, Precis of Modern Electrical Engineering I).

3.918	Image Evaluation and Optical System Criterion I . . . . .	2
3.919	Image Evaluation and Optical System Criterion II . . . . .	2
3.920	Image Evaluation and Optical System Criterion III . . . . .	2
3.921	Optical Properties of Matter I . . . . .	2
3.922	Optical Properties of Matter II . . . . .	2
3.923	Advanced Optics Laboratory and Current Developments I . . . . .	2
3.924	Advanced Optics Laboratory and Current Developments II . . . . .	2

A total of ten hours of electives are required which may be selected from graduate courses in science and engineering for which the student has the necessary preparation.

### DESCRIPTION OF COURSES

All courses carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Course descriptions are applicable to both day and evening courses. Quarters indicated following course descriptions refer primarily to the part-time program.

**3.800 Applied Electron and Ion Physics I**                              Prep. Bachelor of Science degree in Electrical Engineering or Physics or 3.977, Precis of Modern Electrical Engineering III

The dynamics of charged particles in electromagnetic fields. The topics stressed are those closely related to engineering applications. The topics to be covered in the first quarter are: summary review of vector analysis and electromagnetic field theory; non-relativistic dynamics of electrons and ions in static electric and magnetic fields; introduction to electron and ion beam optics; space charge effects.

(Offered yearly, Fall quarter)

**3.801 Applied Electron and Ion Physics II**                              Prep. 3.800, Applied Electron and Ion Physics I

Continuation of 3.800. Topics to be covered are: dynamics of charged particles in time-varying electromagnetic fields; applications to beam-wave interaction phenomena and microwave electronic devices; relativistic effects in charged particle dynamics in fields; application to high energy physics devices.

(Offered yearly, Winter quarter)

**3.802 Applied Electron and Ion Physics III**

Prep. 3.801, Applied

## Electron and Ion Physics II

Continuation of 3.801. Topics in physical electronics; large aggregations of electrons; electron emission, Fermi-Dirac statistics; introduction to plasma physics; Boltzmann equation; kinetic theory and quasi-hydro-dynamical approach to dynamics of fully and partially ionized gases; collisions; pinch effect, magneto-ionics; wave propagation in plasma media; beam-plasma-wave interactions. (Offered yearly, Spring quarter)

**3.806 Lasers I**Prep. Bachelor of Science degree in  
Engineering or Science

Device design theory, fabrication and technology, and applications of lasers will be presented in detail. A course in or familiarity with introductory quantum mechanics or semiconductor physics is desirable but not essential.

(Offered yearly, Fall quarter)

**3.807 Lasers II**

Prep. 3.806, Lasers I

Further material on the design theory, fabrication and applications of lasers will be presented with special emphasis on the more complex problems and the underlying mathematical analysis. A few applications will be considered in detail, such as optical ranging, and optical information processing.

(Offered yearly, Winter quarter)

**3.808 Optoelectronic Engineering**Prep. Bachelor of Science degree in  
Electrical Engineering or Physics

Course 3.806 Lasers I and Course 3.851 Semiconductor Electronics or their equivalents are helpful but not essential.

Fundamental concepts, design theory and system theory of optoelectronics will be presented including analysis of sources detectors, switches, display information processing holography and tracking.

(Offered yearly, Spring quarter)

**3.810 Physics of the Upper Atmosphere I**

Prep. Bachelor of

Science degree in Engineering or Science

(Offered 1968-69, Fall quarter)

**3.811 Physics of the Upper Atmosphere II**

Prep. 3.876,

Electromagnetic Theory B or 3.877, Electromagnetic Theory

(Offered 1968-69, Winter quarter)

**3.812 Physics of the Upper Atmosphere III**

Prep. 3.810 and 3.811,

Physics of the Upper Atmosphere I and II

This series of courses treats the physics of the atmosphere from the lowest parts of the ionized regions upwards, and includes some of the relevant aspects of solar-terrestrial relations. Topics discussed include geomagnetism, the motion of charged particles in fields, the polar aurora, airglow, propagation of electromagnetic waves in ionized media, layer formation in the atmosphere, the earth's ionosphere, rocket and satellite borne probes, and modern theoretical work on these topics.

(Offered 1968-69, Spring quarter)

<b>3.817 Acoustics I</b>	Prep. Bachelor of Science degree in Engineering or Science
The wave equation in one, two, and three dimensions; absorption and transmission phenomena; ray acoustics; energy density and intensity of sound waves.	(Offered yearly, Fall quarter)
<b>3.818 Acoustics II</b>	Prep. 3.817, Acoustics I
Electro-mechano-acoustic systems, lumped-parameter analysis, sound measurements, experimental acoustics, piezoelectric and magnetostrictive transducers, reproduction of sound.	(Offered yearly, Winter quarter)
<b>3.819 Acoustics III</b>	Prep. 3.818, Acoustics II
Elements of ultrasonics, underwater sound, psychoacoustics, and architectural acoustics.	(Offered yearly, Spring quarter)
<b>3.820 Mathematical Methods in Electrical Engineering I</b>	Prep. Bachelor of Science degree in Engineering or Physical Science
Definition and representation of a complex variable and functions of a complex variable. Laurent series, residues, contour integration, conformal mapping and Riemann surfaces. Electrical Engineering applications to Fourier theory, Hilbert transforms, stability of linear systems and electrostatics. (Not open to Northeastern graduates who have completed 3.292)	(Offered yearly, Fall quarter)
<b>3.821 Mathematical Methods in Engineering II</b>	Prep. 10.805, Advanced Mathematics or 10.806, Advanced Mathematics
Linear algebra and matrix analysis applied to systems theory; linear equations, determinants, invariance, quadratic forms, eigenvalues and the simultaneous diagonalization of two matrices. Compound matrices and the Binet-Cauchy Theorem. Illustrative applications to Electrical Engineering problems drawn from circuit theory, topology, probability theory and engineering physics. (Not open to Northeastern graduates who have completed 3.293)	(Offered yearly, Winter quarter)
<b>3.825 Transients in Linear Systems A</b>	Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I
Basic concepts of system theory with State Variable formulation of system differential equations. Solution of state equations for linear, time-invariant systems.	(Offered yearly, Fall, Winter, and Spring quarters)
<b>3.826 Transients in Linear Systems B</b>	Prep. 3.825, Transients in Linear Systems A
Continuation of 3.825 with consideration of canonical forms for computer simulation. Practical elements of transient response and system stability.	(Offered yearly, Fall, Winter, and Spring quarters)

**3.827 Transients in Linear Systems** Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I  
Offered only to day students. Includes the material given in 3.825, Transients in Linear Systems A and 3.826, Transients in Linear Systems B.  
(Offered yearly, Fall and Winter quarters. 4 Q.H. credits)

**3.830 Linear Circuit Theory I-A** Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I  
Matrix circuit analysis including m-port parameter systems. Positive real functions. Energy function. Driving-point synthesis techniques for LC, RC, and RL networks. (Offered yearly, Fall, Winter, and Spring quarters)

**3.831 Linear Circuit Theory I-B** Prep. 3.830, Linear Circuit Theory I-A  
Driving-point synthesis techniques with RLC networks. Properties of two-port networks. Two-port synthesis including the parallel ladder realization. Lattice synthesis.  
(Offered yearly, Fall, Winter, and Spring quarters)

**3.832 Linear Circuit Theory I** Prep. Bachelor of Science degree in Electrical Engineering or 3.975, Precis of Modern Electrical Engineering I  
Offered only to day students. Includes the material given in 3.830, Linear Circuit Theory I-A and 3.831, Linear Circuit Theory I-B.  
(Offered yearly, Fall and Spring quarters. 4 Q.H. credits)

**3.833 Linear Circuit Theory II** Prep. 3.831, Linear Circuit Theory I-B or 3.832, Linear Circuit Theory I  
Synthesis of resistance-terminated two-port networks including techniques due to Darlington and Miyata. Double-resistive-terminated lossless two-port networks. Elements of m-port synthesis.  
(Offered 1968-69, Fall quarter)

**3.834 Linear Circuit Theory III** Prep. 3.831, Linear Circuit Theory I-B or 3.832, Linear Circuit Theory I  
Introduction to the approximation problem. Criteria of approximations. Frequency-domain approximations including those of Butterworth, Chebyshev, and Bessel. Use of potential theory analogies. Approximation over a prescribed frequency band. Minimization and correction of distortions in linear networks.  
(Offered 1968-69, Winter quarter)

**3.835 Linear Circuit Theory IV** Prep. 3.831, Linear Circuit Theory I-B or 3.832, Linear Circuit Theory I  
Techniques of time-domain synthesis. Time-domain approximations including the use of orthonormal functions, Prony's method, Pade's method and interpolation functions. Time-domain synthesis of delay networks.  
(Offered 1968-69, Spring quarter)

**3.837 Topological Circuit Analysis and Linear Graphs** Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976 and 3.977, Precis of Modern Electrical Engineering I, II and III  
 Mathematical properties of the Kirchoff equations. Matrix and topological circuit analysis. Models for linear networks; unistor; gyristor, gyrator. Selected applications of graph theory in the fields of network synthesis, switching theory, and communication networks.

(Offered 1968-69, Fall quarter)

**3.838 Nonlinear Circuit Analysis** Prep. 3.831, Linear Circuit Theory I-B or 3.832, Linear Circuit Theory I  
 Numerical, graphical, and analytical methods for the solution of physical systems described by nonlinear differential equations. Equations with known exact solutions such as, Euler-Cauchy, Riccati, and Bernoulli. Elliptic functions. Analysis of singular points. Linear, time-varying systems. Stability of nonlinear systems. Lyapunov theory.

(Offered yearly, Winter quarter)

**3.840 Linear Active Circuits A** Prep. Bachelor of Science degree in Electrical Engineering or 3.976, Precis of Modern Electrical Engineering II  
 The mathematical formulation of active networks is developed from function-theoretic concepts and device representation. Topics included are Butterworth and Chebychev functions, low pass to band pass transforms, stability and realizability criteria, and development of transistors and other solid state device models. These are applied to the operation and realization of low pass, band pass, and distributed amplifiers. (Not open to students who have completed 3.845, Semi-Conductor Circuit Theory I or 3.605, Transistor Engineering.) (Offered yearly, Fall quarter)

**3.841 Linear Active Circuits B** Prep. 3.840, Linear Active Circuits A  
 Feedback amplifier concepts, including stability, impedance, nonreciprocal transmission behavior and the effects of noise and other extraneous signals are developed from return difference and return ratio viewpoints. Typical design examples are included. The negative impedance converter and other basic building blocks are used in the synthesis of driving point and transfer functions. (Not open to students who have completed 3.846, Semi-Conductor Circuit Theory II or 3.606, Transistor Engineering.)  
 (Offered yearly, Winter quarter)

**3.842 Linear Active Circuits** Prep. Bachelor of Science degree in Electrical Engineering or 3.976, Precis of Modern Electrical Engineering II  
 Offered only to day students. Includes the material given in 3.840, Linear Active Circuits A and 3.841, Linear Active Circuits B.  
 (Offered yearly, Winter and Spring quarters. 4 Q.H. credits)

**3.843 Linear Active Networks**

Prep. 3.841, Linear Active Circuits B  
or 3.842, Linear Active Circuits

A continuation of the material covered in Linear Active Circuits A and B. Emphasis will be placed on feedback amplifier systems, including multi-loop amplifier design. These techniques will be applied to integrated circuit realizations of basic active networks. (Offered yearly, Spring quarter)

**3.850 Semi-Conductor Electronics A**

Prep. Bachelor of Science  
degree in Engineering or Science

The fundamental concepts and theory underlying the present day semi-conductor devices will be presented for the electronics engineer. Subjects covered include: energy band models of a semiconductor, equilibrium distributions, carrier transport phenomena, the diode equation.

(Offered yearly, Winter quarter)

**3.851 Semi-Conductor Electronics B**

Prep. 3.850, Semi-Conductor  
Electronics A

The fundamental concepts of semiconductor electronics will be further developed. Subjects covered include: transistors, tunnel diodes, other devices, luminescence, material preparation.

(Offered yearly, Spring quarter)

**3.852 Semi-Conductor Electronics**

Prep. Bachelor of Science  
degree in Engineering or Science

Offered only to day students. Includes the material given in 3.850, Semi-Conductor Electronics A and 3.851, Semi-Conductor Electronics B.

(Offered yearly, Winter quarter. 4 Q.H. credits)

**3.856 Microelectronics I**

Prep. Bachelor of Science  
degree in Engineering or Science

The fundamentals for microelectronics will be reviewed, including band theory, physical parameters, crystal growth, masking diffusion, isolation, etc. Simple integrated circuit design and fabrication will then be analyzed. Emphasis will be placed on the monolithic silicon integrated circuit approach.

(Offered 1967-68, Fall quarter)

**3.857 Microelectronics II**

Prep. 3.856, Microelectronics I

The electrical and physical design of microelectronic (integrated) circuits will be considered in detail. Detailed examples in digital logic and precision linear amplifiers will be included.

(Offered 1967-68, Winter quarter)

**3.860 Pulse Processing I**

Prep. Bachelor of Science

degree in Electrical Engineering or 3.975, 3.976 and 3.977,  
Precis of Modern Electrical Engineering I, II and III

The principles and techniques of pulse-forming and pulse-processing circuits basic to radar, television, digital computation, pulse modulation

systems, and data-processing systems. Wave shaping circuits, logic circuits, switching circuits, digital devices and time base generators will be covered.

(Offered 1967-68, Winter quarter)

**3.861 Pulse Processing II** Prep. 3.860, Pulse Processing I  
 Continuation of 3.860, Pulse Processing I, to include digital filters and correlators, pulse transformers, memory devices, and linear delay devices.

(Offered 1967-68, Spring quarter)

**3.865 Radar Systems I** Prep. Background in Probability and Fourier Analysis  
 Emphasis on the systems aspects of radar engineering. Topics covered include antennas; low-noise receivers; high-power transmitters; range, angle, and Doppler tracking systems; search radar systems. Mathematical descriptions are used throughout

(Offered yearly, Fall quarter)

**3.866 Radar Systems II** Prep. 3.865, Radar Systems I  
 Continuation of 3.865, Radar Systems I, a further consideration of systems aspects. The principles of radar detection theory; matched filter and correlation receiver design; radar ambiguity function; radar uncertainty principles; radar waveform synthesis; fundamental accuracy limits; generalized tracking problems.

(Offered yearly, Winter quarter)

**3.871 Space Electronics Systems I** Prep. Knowledge of Fourier Transforms  
 Primarily concerned with aerospace communications, Antenna gain, space loss, cosmic and atmospheric noise, polarization loss and receiver noise temperature will be discussed as factors influencing the system signal-to-noise ratio. Contemporary signal processing and modulation systems will be analyzed in some detail in order to arrive at comparative performance figures. Treatment of frequency division multiplexing will include commutation, smoothing, sub-carrier pre-emphasis and phase-locked discrimination.

(Offered yearly, Fall quarter)

**3.872 Space Electronics Systems II** Prep 3.871, Space Electronic Systems I  
 Continuation of 3.871, Space Electronic Systems I, to include communication systems suitable for deep space probes. Multiplex systems with major concentration on various time multiplex systems. Emphasis will be placed upon code formulation for signal transmission, matched filtering upon reception and data processing. Typical instrumentation systems will be discussed as illustrations.

(Offered yearly, Winter quarter)

**3.875 Electromagnetic Theory A** Prep. Advanced Calculus and Vector Analysis  
 Experimental laws of Gauss, Ampere and Faraday. Maxwell's equations. Time harmonic complex fields. Application to wave motion, waveguides and radiation.

(Offered yearly, Fall quarter)

**3.876 Electromagnetic Theory B**Prep. 3.875, Electromagnetic  
Theory A

Uniqueness, equivalence and image theory. Application to the slot radiator. Solution of the wave equation in rectangular and cylindrical coordinates. Mode sets. Probes and apertures in waveguides. Introduction to propagation in anisotropic media. (Offered yearly, Winter quarter)

**3.877 Electromagnetic Theory**Prep. Advanced Calculus and  
Vector Analysis

Offered only to day students. Includes the material given in 3.875, Electromagnetic Theory A and 3.876, Electromagnetic Theory B.

(Offered yearly, Winter and Spring quarters. 4 Q.H. credits)

**3.880 Microwave Theory**Prep. 3.876, Electromagnetic Theory B  
or 3.877, Electromagnetic Theory

Propagation of electromagnetic waves on periodic structures. Propagation on a helix. Waves on electron beams. Coupled-mode theory. Travelling wave devices. Propagation in anisotropic media. Ferrite devices. (Offered yearly, Spring quarter)

**3.881 Microwave Circuits I**Prep. 3.876, Electromagnetic  
Theory B or 3.877, Electromagnetic Theory

Review of microwave circuit theorems; scattering matrices and applications; eigenvalue problem; symmetrical and miscellaneous junctions; applications of 3-db couplers; polarizers, phase shifters and attenuators; non-reciprocal and ferrite devices. (Offered yearly, Winter quarter)

**3.882 Microwave Circuits II**

Prep. 3.881, Microwave Circuits I

One-port resonant cavity; transmission cavity; analysis and synthesis of microwave filters; travelling-wave resonators; periodically loaded lines; selected microwave system considerations.

(Offered yearly, Spring quarter)

**3.885 Antenna Theory**Prep. 3.876, Electromagnetic Theory B  
or 3.877, Electromagnetic Theory

An advanced study of the radiation and circuit properties of antennas in simple and complex media. Special topics in array theory and particular types of antennas will be presented as an application of the general theory. Problems related to antennas in space and radio astronomy will also be covered. Designed to prepare the student for advanced research in the field. (Offered yearly, Spring quarter)

**3.890 Electromagnetic Wave Propagation I**Prep. 10.806, Advanced  
Mathematics or equivalent

Topics in wave propagation of prime importance in communications and space physics. Review of wave propagation in a homogeneous medium. Physical processes in the atmosphere. The formation and structure of the ionosphere. Basic magneto-ionic theory. Propagation of waves in a spatially varying medium. Ray theory.

(Offered 1968-69, Winter quarter)

**3.891 Electromagnetic Wave Propagation II** Prep. 3.890,  
**Electromagnetic Wave Propagation I**  
 Application of the theory of the oblique incidence of radio waves on the ionosphere, including the effects of the presence of the geomagnetic field, to radio communications. The interpretation of ionograms. Path prediction and field strength computations. Absorption. Top side soundings. Incoherent thermal scatter. Ionospheric irregularities and motions, and their study by space and frequency diversity techniques and other methods.  
 (Offered 1968-69, Spring quarter)

**3.900 Communication Theory — Introduction A** Prep. Undergraduate course in Laplace Transforms or Complex Variables  
 The first course in the communication theory sequence which is to present an engineering analysis of statistical communication problems. Designed to provide the basic tools for the study of linear optimum filtering theory, information theory, and detection theory, which are the subject matters of subsequent courses. Particular topics include signal theory, Fourier analysis, power spectrum and correlation function, sampling theorem and an introduction to probability theory.  
 (Offered yearly, Fall, Winter, and Spring quarters)

**3.901 Communication Theory — Introduction B** Prep. 3.900,  
**Communication Theory — Introduction A**  
 Continuation of course 3.900, Communication Theory — Introduction A. It deals first with the description and analysis of signals and noise as stochastic processes. Then as an application of the statistical techniques, Wiener's theory of linear optimum filtering and prediction will be presented.  
 (Offered yearly, Fall, Winter, and Spring quarters)

**3.902 Communication Theory — Introduction** Prep. Knowledge of Laplace Transforms or Complex Variables  
 Offered only to day students. Includes the material given in 3.900, Communication Theory — Introduction A and 3.901, Communication Theory — Introduction B.  
 (Offered yearly, Fall quarter. 4 Q.H. credits)

**3.903 Communication Theory — Information Theory and Coding A** Prep. 3.900, Communication Theory — Introduction A or  
 3.902, Communication Theory — Introduction or Probability  
 Deals principally with three aspects of information theory; the statistical description of sources and the probabilistic measure of their information contents, the determination of channel capacity, and the fundamental coding theorems.  
 (Offered yearly, Fall, Winter and Spring quarters)

**3.904 Communication Theory — Information Theory and Coding B** Prep. 3.903, Communication Theory — Information Theory and Coding A  
 Continuation of 3.903, Communication Theory — Information Theory and Coding A. The theory of coding and decoding for efficient and reliable communication. Particular subjects include the derivation of theoretical

bounds of error in coding, methods of constructing algebraic and probabilistic codes, and decoding techniques. Some knowledge of elementary aspects of modern algebra is desirable but not necessary.

(Offered yearly, Fall, Winter, and Spring quarters)

**3.905 Communication Theory — Information Theory and Coding**

Prep. 3.900, Communication Theory — Introduction  
A or Probability

Offered only to day students. Includes the material given in 3.903, Communication Theory — Information Theory and Coding A and 3.904, Communication Theory — Information Theory and Coding B.

(Offered yearly, Spring quarter. 4 Q.H. credits)

**3.906 Communication Theory — Detection A**

Prep. 3.901,

Communication Theory — Introduction B or  
3.902, Communication Theory Introduction

This course deals with the theory of signal detection in the presence of noise based on statistical methods of hypothesis testing. Applications to the detection of known signals in white or colored gaussian noise, and of signals with unknown parameters, such as random phase and amplitude, will be presented in detail. A brief discussion on the detection by multiple observations will also be given. (Offered yearly, Winter quarter)

**3.907 Communication Theory — Detection B**

Prep. 3.906,

Communication Theory — Detection A

This course is a continuation of 3.906, Communication Theory — Detection A. It deals with the theory of signal detection in the presence of noise based on statistical methods of estimation. Applications to the estimation of signal parameters such as arrival time and carrier frequency will be presented in detail. A brief discussion on signal resolution problems and use of stochastic signals will also be given.

(Offered yearly, Spring quarter)

**3.908 Special Topics in Communication Theory**

Prep. 3.904,

Communication Theory — Information Theory  
and Coding B or 3.905, Communication  
Theory — Information Theory and Coding

This course is designed to discuss further in depth either the information theoretical or detection theoretical aspects of communication. The subject matter changes from year to year. Selected topics are covered in seminars, prepared by Ph.D. candidates, in which the students participate in reading and discussing current technical literature on the subject.

(Offered 1967-68, Fall quarter)

**3.910 Nonlinear Systems I**

Prep. An undergraduate course in Signals  
and Systems and 3.900, Communication  
Theory-Introduction A or equivalent

Operators and functionals. Functional power series representation of nonlinear systems. Functional representation of the response of a non-

linear system when its input is either a constant, a sinusoid, a transient, or a random process. System transforms. Applications to the analysis and synthesis of nonlinear systems in terms of functional power series.

(Offered yearly, Fall quarter)

### **3.911 Nonlinear Systems II**

Prep. 3.910, Nonlinear Systems I and either 3.901, Communication Theory — Introduction B or 3.902, Communication Theory — Introduction

Orthogonal systems of functionals. Representation and analysis of nonlinear systems in terms of orthogonal systems of functionals. The optimum nonlinear filter, predictor, and general operator. Special classes of nonlinear systems. Determination of optimum nonlinear systems for generalized error criteria.

(Offered yearly, Winter quarter)

### **3.912 Nonlinear Systems III**

Prep. 3.911, Nonlinear Systems II

Functional analysis of systems characterized by nonlinear differential equations. Operator approach to system theory and its relationship to differential equation representations. The methods of iteration in nonlinear theory and its application to feedback systems.

(Offered yearly, Spring quarter)

### **3.915 Geometric Optics**

Prep. 10.805, Advanced Mathematics or equivalent

Fermat's principle and the fundamental laws of image formation. Eikonal equation and Hamilton's characteristic functions — canonical formalisms. Matrix approach to paraxial optics and ray tracing. Aberration theory; 3rd order theory; thin lenses and concentric systems; basic elements of optical design.

(Offered yearly, Fall quarter)

### **3.916 Physical (wave) Optics**

Prep. 3.915, Geometric Optics or equivalent

Basic Properties of the electromagnetic field; Maxwell's equations and the wave equation. Scalar and vector waves; reflection refraction and propagation of waves. Polarization Theory of partial coherence; scattering. Theory of interference and diffraction; Huygen's — Fresnel and Kirchoff solutions; theory of interferometric instrumentation.

(Offered yearly, Winter quarter)

### **3.917 Advanced Optics**

Prep. 3.916, Physical Optics or equivalent

Advanced topics in the application of communication theory to optical problems; transfer and spread functions; statistical optics and matrix methods for advanced optical systems; spacial filtering.

(Offered yearly, Spring quarter)

### **3.918 Image Evaluation and Optical Systems Criterion I**

Should be taken concurrently with 3.915, Geometric Optics.

1 hour lecture, 2 hours laboratory.

(Offered yearly, Fall quarter)

**3.919 Image Evaluation and Optical Systems Criterion II**

Should be taken concurrently with 3.916, Physical (wave) Optics.

1 hour lecture, 2 hours laboratory. (Offered yearly, Winter quarter)

**3.920 Image Evaluation and Optical Systems Criterion**

Should be taken concurrently with 3.917, Advanced Optics.

1 hour lecture, 2 hours laboratory. (Offered yearly, Spring quarter)

These courses are intended to accompany 3.915, Geometric Optics; 3.916, Physical (wave) Optics; 3.917, Advanced Optics to provide experimental background for the theory developed therein. They would include basic optical techniques such as alignment procedures, location of principal and nodal planes. Resolution studies including Rayleigh and other criteria, test targets and methods. Coherent imaging and Abbe's theory. Aberrations and evaluation techniques.

**3.921 Optical Properties of Matter I**

Prep. 11.801, Introductory Modern Physics or equivalent

Emission processes; quantum theory of emission; emission, absorption and black body spectra, stimulated emission.

(Offered 1967-68, Fall quarter)

**3.922 Optical Properties of Matter II**

Prep. 3.921, Optical Properties of Matter I

Detection; solid state, photoemissive, photovoltaic, photographic and physiological detection and measurement. Transmission; solids, liquids and gases, crystals and fibres. (Offered 1967-68, Winter quarter)

**3.923 Advanced Optics Laboratory and Current Developments**

Prep. 3.917, Advanced Optics; 3.918, Image Evaluation and Optical Systems Criterion I; and 3.919, Image Evaluation and Optical Systems Criterion II

Special topics in modern optics and optical techniques requiring the presentation of a paper by participants at termination of the course.

(Offered 1967-68, Winter quarter)

**3.924 Advanced Optics Laboratory and Current Developments**

Prep. 3.923, Advanced Optics Laboratory and Current Developments

Special topics in modern optics and optical techniques requiring the presentation of a paper by participants at termination of the course.

(Offered 1967-68, Spring quarter)

**3.925 Power Circuit Analysis I**

Prep. Bachelor of Science degree in Electrical Engineering

Fundamental concepts of single-phase and polyphase power systems; definitions of terms; use of per unit quantities; equivalent circuits of

symmetrical 3-phase systems; introduction to symmetrical components; short circuits on systems with a single power source.

(Offered yearly, Fall quarter)

**3.926 Power Circuit Analysis II**

Prep. 3.925, Power Circuit Analysis I

This course is a continuation of 3.925, Power Circuit Analysis I. Sequence impedances of various power-system elements are considered from application point of view; unsymmetrical faults on otherwise symmetrical 3-phase systems; open conductors and asymmetrical connections and loadings; analysis of simultaneous faults on 3-phase systems; 2-phase systems.

(Offered yearly, Winter quarter)

**3.927 Power Circuit Analysis III**

Prep. 3.926, Power Circuit Analysis II

This course is a continuation of 3.926, Power Circuit Analysis II. Introduction to Clarke components and applications in analysis of asymmetrical systems and faults; transmission line theory; protective relaying; fundamentals of system stability.

(Offered yearly, Spring quarter)

**3.930 Power System Planning**

Prep. 3.925, Power Circuit Analysis I

Engineering and economic aspects underlying system development and planning. Probability methods of determining installed and spinning-reserve requirements. Mathematical models of system operation for production-costing studies. Detailed examples include economic comparison of nuclear and fossil-fired plants, the role of pumped-hydro generation, power pooling, and coordinated planning of interconnected systems, and the functions of high-voltage and EHV transmission in planning and operation.

(Offered 1967-68, Spring quarter)

**3.940 Electric Machinery Theory I**

Prep. Bachelor of Science degree in Electrical Engineering or 3.975, 3.976, and 3.977, Precis of Modern Electrical Engineering I, II, and III

Review of electromagnetic theory as applied to electrical machines; dynamic analysis of a-c induction machines; special topics in the operation of d-c machines.

(Offered yearly, Fall quarter)

**3.941 Electric Machinery Theory II**

Prep. 3.940, Electric Machinery Theory I

Analysis of the principles of operation of synchronous generators and motors with comprehensive investigation of characteristics in terms of dqo components and symmetrical components; consideration of the transient behavior of the machine.

(Offered yearly, Winter quarter)

**3.942 Electric Machinery Theory III**Prep. 3.941, Electric  
Machinery Theory II

Dynamic behavior of electrical machinery; comprehensive treatment of the problem of stability as applied to electric machinery.

(Offered yearly, Spring quarter)

**3.950 Systems Analysis I**Prep. Bachelor of Science degree  
in Engineering or Science

Review of probability and statistics. Elements of Markov processes, queuing as a Markov process. Finite and infinite queue systems, multiple-server, parallel and sequential queuing. Flow-graph representation of queuing systems, equivalence of flow-graph and analog-computer representation.

(Offered yearly, Fall quarter)

**3.951 Systems Analysis II**

Prep. 3.950, Systems Analysis I

Linear programming; transportation problem, graphical representation. Simplex method, concept of duality and its use. Fundamental concepts in game theory. Solution of rectangular games. Pure and mixed strategies, maximum and minmax principle. Zero and non-zero-sum games, infinite games. Transformation of games into linear programming problems. Other methods of solving competitive-situation problems.

(Offered yearly, Winter quarter)

**3.952 Systems Analysis III**Prep. 10.805, Advanced Mathematics  
or 10.806, Advanced Mathematics

Various methods of optimization of deterministic systems will be studied. Emphasis will be placed on steepest-descent and dynamic-programming methods. Examples from the fields of electrical, mechanical, and aerospace technology will be considered.

(Offered yearly, Spring quarter)

**3.953 Systems Analysis IV**Prep. 3.952, Systems Analysis III,  
10.831, Probability, or equivalent

Optimal stochastic control of linear systems; optimal filtering, prediction, and identification; and adaptive control techniques will be studied. Statistical decision problems for linear and nonlinear systems.

(Offered 1968-69, Fall quarter)

**3.957 Control Systems I-A — Analysis**Prep. Knowledge of transient  
analysis and Laplace transforms

Transient performance of linear feedback control systems for deterministic inputs. Block diagram representation and analog computer modelling of typical systems. Discussion of stability criteria. Development and application of root-locus and Nyquist methods for complementary time and frequency domain analysis.

(Offered yearly, Fall quarter)

**3.958 Control Systems I-B — Synthesis      Prep. 3.957, Control Systems I-A — Analysis**

Comparison of several compensation configurations for both static and dynamic performance criteria. System design using root-locus and Bode-Nichols methods. Discussion of pole-zero synthesis techniques and consideration of the multi-input problem. Practical aspects of system design and review of component technology. (Offered yearly, Winter quarter)

**3.959 Control Systems I — Analysis and Synthesis**

Prep. Knowledge of transient analysis and Laplace transforms

Offered only to day students. Includes the material given in 3.957, Control Systems I-A — Analysis and 3.958, Control Systems I-B — Synthesis. (Offered yearly, Fall quarter. 4 Q.H. credits)

**3.960 Control Systems II-A — Nonlinear Systems      Prep. 3.958, Control Systems I-B — Synthesis or 3.959, Control Systems I — Analysis and Synthesis**

Analog and digital computer solution of nonlinear system problems. Discussion of describing function and phase plane analysis techniques. Introduction to the methods of Liapunov. Design of intentionally non linear systems including comparison of compensation schemes for stabilization of bang-bang control systems.

(Offered yearly, Spring quarter)

**3.961 Control Systems II-B — Stochastic Systems      Prep. 3.958, Control Systems I-B — Synthesis or 3.959, Control Systems — Analysis and Synthesis**

Statistical models for random inputs encountered in the operation of control systems. Filtering and prediction, correlation functions and spectral densities. Optimum design for stationary random processes. Analog and digital simulation for system design.

(Offered yearly, Fall quarter)

**3.962 Control Systems II — Nonlinear and Stochastic Systems**

Prep. 3.958, Control Systems I-B — Synthesis or 3.959, Control Systems — Analysis and Synthesis

Offered only to day students. Includes the material given in 3.960 Control Systems II-A — Nonlinear Systems and 3.961 Control Systems II-B — Stochastic Systems.

(Offered yearly, Spring quarter. 4 Q.H. credits)

**3.963 Digital and Sampled-Data Control Systems      Prep. 3.958, Control Systems I-B Synthesis or 3.959, Control Systems I — Analysis and Synthesis**

Treatment of linear sampled-data control systems by means of the z-transform. Development of methods for analysis and synthesis of

control systems with digital components and sampled-data inputs. Discussion of related topics including difference equations and digital filtering.  
(Offered yearly, Winter quarter)

**3.964 Optimal Control Theory**      Prep. 3.826, Transients in Linear Systems B or 3.827, Transients in Linear Systems  
Discussion of the optimal control problems with reference to space and process control applications. Formulation of problem in terms of state variables. Variational calculus solution. Numerical solutions by dynamic programming and steepest-descent algorithms.  
(Offered yearly, Spring quarter)

**3.967 Switching Circuits I**      Prep. Bachelor of Science degree in Engineering or Science  
Basic relay networks will be treated by the methods of switching algebra. Combinational, sequential and counting circuits will be given as well as the theory of error detecting and translating circuits.  
(Offered yearly, Fall quarter)

**3.968 Switching Circuits II**      Prep. 3.967, Switching Circuits I  
Application of the material covered in 3.967, Switching Circuits I. This includes work with iterative networks, sequential circuits and special coding techniques.  
(Offered yearly, Winter quarter)

**3.970 Digital Computer Programming and Applications I**      Prep. Introductory knowledge of programming  
Review of fundamentals; programming techniques; input/output techniques; computer languages and programming systems; applications to science, business, and real-time control.  
(Offered yearly, Fall and Spring quarters)

**3.971 Digital Computer Programming and Applications II**      Prep. 3.970, Digital Computer Programming and Applications I  
Applications to retrieval, pattern problems, man-machine techniques, simulation, etc.; construction of programming systems including compilers, interpreters, etc.; time sharing and multi-processing; miscellaneous advanced topics.  
(Offered yearly, Winter quarter)

**3.972 Digital Computer Engineering I**      Prep. 3.970, Digital Computer Programming and Applications I plus knowledge of pulse circuits  
Review of fundamentals; review of Boolean algebra and sequential nets; digital circuits; subsystem components including counters, adders, etc.; memory devices; control.  
(Offered yearly, Spring quarter)

**3.973 Digital Computer Engineering II**      Prep. 3.972, Digital Computer Engineering I  
The design of a digital computer in some detail; input-output design techniques; fabrication techniques; component state-of-the-art.  
(Offered yearly, Fall quarter)

**3.975 Precis of Modern Electrical Engineering I**      Prep. Bachelor of Science degree in Engineering or Science plus knowledge of matrix algebra  
(Offered yearly, Fall quarter)

**3.976 Precis of Modern Electrical Engineering II**      Prep. Bachelor of Science degree in Engineering or Science  
(Offered yearly, Winter quarter)

**3.977 Precis of Modern Electrical Engineering III**      Prep. Bachelor of Science degree in Engineering or Science  
(Offered yearly, Spring quarter)  
The preceding three precis courses are intended primarily for those whose undergraduate major was in an engineering or scientific field other than electrical engineering. They are also recommended for students 5 to 10 years away from their bachelor's degree in Electrical Engineering who feel the need for a review of electrical science. They are open only to students in these categories. The material is basically undergraduate in nature but the viewpoint and depth are at the mature level appropriate to graduate students. Part I deals with the theory of electric circuits and linear systems, Part II with electronics, and Part III with field theory from the engineering viewpoint.

**3.980 Seminar I**      Prep. Bachelor of Science degree in Engineering or Science  
A library survey of a selected topic in the general field of electrical engineering with an oral presentation based on this survey. Participation in the departmental seminar program of guest lecturers.  
(Offered yearly, Fall and Winter quarters)

**3.981 Seminar II**      Prep. 3.980, Seminar I  
The preparation of a research paper suitable for publication in a professional journal, plus an oral presentation of this report.  
(Offered yearly, Winter and Spring quarters)

**3.983 Doctoral Seminar I**      Prep. Passing of Ph.D. Qualifying Exam  
Two hours per week of presentation and discussion of topics at a level compatible with a doctoral program. Subject matter may cover a wide range of scientific and engineering fields. (Only S or F grades will be assigned for this course.)  
(Offered yearly, Fall quarter)

**3.984 Doctoral Seminar II**

Continuation of 3.983, Doctoral Seminar I. (Only S or F grades will be assigned for this course.)

Prep. 3.983, Doctoral Seminar I  
(Offered yearly, Winter quarter)

**3.986 Master's Thesis**

Prep. Bachelor of Science degree  
in Engineering or Science

Analytical and/or experimental work conducted under the auspices of the department. (Offered yearly, Fall, Winter, and Spring quarters)

**3.988 Doctoral Thesis**

Theoretical and/or experimental work conducted under the auspices of the department. (Offered yearly, Fall, Winter, and Spring quarters)

**3.990 Doctoral Reading**

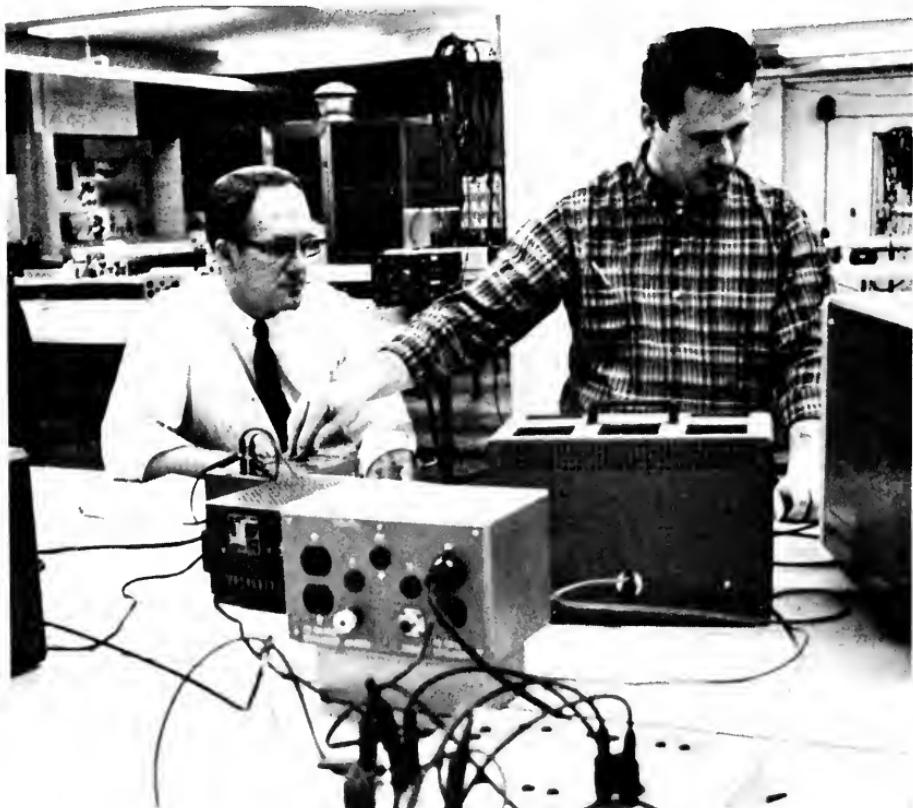
Material approved by the candidate's advisor. (Only S or F grades will be assigned for this course.)

(Offered yearly, Fall, Winter, and Spring quarters)

**3.995 Special Problems in Electrical Engineering**

Prep. Consent of  
Dept. Chairman

Theoretical or experimental work under individual faculty supervision.  
(Offered yearly, Fall, Winter, and Spring quarters)



*Industrial Engineering  
and  
Engineering Management*

## Admission

To be enrolled for graduate work leading to the degree of Master of Science in Industrial Engineering, applicants must have obtained a Bachelor of Science degree in some engineering field from a recognized institution. If the student has had no accounting, it will be necessary to take basic accounting as an elective.

## MASTER OF SCIENCE IN INDUSTRIAL ENGINEERING

## **Full-Time Program on Co-operative Plan**

Forty quarter hours of academic work are required. This program may be taken on a co-operative plan. On this plan students take academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. The other three quarters of the two academic years and the Summer after the first year are available for professional employment.

A thesis of six quarter hours of credit is required. A faculty advisor will be appointed to approve the thesis topic and supervise its completion.

The sequence of courses on the co-operative plan will normally be taken according to the following pattern:

<b>First Academic Quarter</b>	<b>Credits</b>	<b>Second Academic Quarter</b>	<b>Credits</b>
5.823 Advanced Production Analysis .....	4	5.809 Advanced Engineering Economy .....	2
5.900 Basic Operations Research .....	4	5.824 Case Studies in Industrial Engineering .....	4
10.831 Probability .....	2	5.914 Advanced Operations Research .....	2
Elective .....	<u>4</u>	10.836 Mathematical Statistics .....	4
	<u>14</u>	Elective .....	<u>2</u>
			<u>14</u>
<b>Third Academic Quarter</b>	<b>Credits</b>		
5.990 Seminar .....	4		
5.991 Thesis .....	6		
Elective .....	<u>2</u>		
	<u>12</u>		

Students may also take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses on this plan is established with the chairman of the department.

### **Electives**

With the approval of the advisor, a maximum of six quarter hours of credit may be elected from courses in the Graduate Division.

## **MASTER OF SCIENCE IN ENGINEERING MANAGEMENT**

### **Evening Part-Time Program**

#### **Admission**

To be enrolled for graduate work in engineering management, applicants must have obtained a Bachelor of Science degree from a recognized institution in an engineering field or in science provided that mathematics has been covered through Calculus. If the student has not had a basic course in accounting, it will be necessary to take two quarter hours of credit work in accounting among his electives.

#### **Program**

The program leading to the Master of Science in Engineering Management is designed for part-time students who may progress according to their abilities and the time available. The purpose of the program is to prepare engineers and scientists to expand their capabilities to assume managerial and supervisory responsibilities in technically oriented organizations. Forty quarter hours of work are required of which 18 quarter hours are specified as follows:

#### **Required Courses**

		<b>Credits</b>
5.801	Analysis of the Industrial Enterprise . . .	2
5.802	Analysis of the Industrial Enterprise . . .	2
5.808	Basic Engineering Economy . . . . .	2
5.830	Finance . . . . .	2
5.831	Finance . . . . .	2
5.901	Basic Operations Research . . . . .	2
5.902	Basic Operations Research . . . . .	2
5.950	Engineering Statistics I . . . . .	2
5.951	Engineering Statistics II . . . . .	2
		<u>18</u>

## **Electives**

All electives may be taken from the graduate courses offered in the Industrial Engineering Department but at least eight quarter hours must be within the department.

The remaining fourteen may be elected from any graduate courses in other engineering fields, in mathematics, or in science for which the student has the necessary preparation. Up to six of the fourteen may be elected from any course in the Graduate Division, subject to the approval of the Director of the Graduate School in which the course is offered.

### **Suggested Elective Sequences**

Although no designated major fields are offered in the Engineering Management program, most students follow one of three broad areas of interest. The following comments are offered as a guide to course selection and are not to suggest required courses. It is hoped that students will elect some broadening courses outside their specific field of interest. For additional information or advice on programs the student should apply to the Graduate School Office or to the program coordinator in the Industrial Engineering Department.

## **Operations Research**

The Operations Research sequence is followed by students interested in the mathematical aspects of solving problems of industry and government and the development of new quantitative techniques in this field. The fundamental courses would usually be:

- 5.903      Inventory Control
- 5.904      Queuing Theory
- 5.905      Analysis with Simulation
- 5.911      Linear Programming
- 5.952      Design of Experiments
- 5.953      Statistical Design Theory

Related courses which students may select in addition to meet their interests include:

- 5.809      Advanced Engineering Economy
- 5.818      Management Information Systems
- 5.827      Basic Economics for Engineers
- 5.906      Industrial Dynamics
- 5.912      Network Planning and Control
- 5.913      Data Processing for Engineers
- 5.916      Engineering Analysis Utilizing Data Processing
- 5.955      Reliability and Maintainability Applications
- 10.804 and 10.805      Advanced Mathematics
- 10.831 and 10.832      Probability
- 10.834 and 10.835      Mathematical Statistics
- 10.838 and 10.839      Stochastic Processes
- 10.871 and 10.872      Matrix Analysis

### **Production Engineering**

The Production Engineering sequence is suggested for students interested in the management or technical support of manufacturing operations. The fundamental courses for most such students would include:

- 5.805 Industrial Budgeting for Engineers
- 5.811 Cost Accounting for Engineers
- 5.817 Advanced Work Design
- 5.820 Personnel Administration for Engineers
- 5.903 Inventory Control and Production Planning
- 5.913 Data Processing for Engineers
- 5.954 Advanced Quality Control
- 5.955 Reliability and Maintainability Applications
- 5.956 Mathematical Theory of Reliability
- 5.957 Designing for Reliability

Related courses which students may select in addition to meet their particular interest include:

- 5.806 Production Forecasting
- 5.809 Advanced Engineering Economy
- 5.814 Executive Development
- 5.816 Industrial Psychology for Engineers
- 5.818 Management Information Systems
- 5.819 Human Factors in Man-Machine Systems
- 5.821 Management and Labor Unions
- 5.822 Value Engineering
- 5.915 Operations Research for Management

### **Management of Technology**

The Management of Technology sequence is suggested for students interested in research, development, testing and engineering programs in technical or government organizations including design of products, processes and equipment. The fundamental courses for these students would be:

- 5.805 Industrial Budgeting for Engineers
- 5.809 Advanced Engineering Economy
- 5.812 Management of Technical Innovation
- 5.815 Legal Aspects of New Technology
- 5.912 Network Planning and Control
- 5.917 Information Retrieval
- 5.952 Design of Experiments

Related courses of general interest in this area include:

- 5.813 Engineering Reports
- 5.816 Industrial Psychology for Engineers
- 5.820 Personnel Administration for Engineers
- 5.828 Industrial Marketing
- 5.905 Analysis with Simulation
- 5.953 Statistical Decision Theory

Those with interest in engineering design might select from the following courses:

5.819	Human Factors in Man-Machine Systems
5.822	Value Engineering
5.916	Engineering Analysis Utilizing Data Processing
5.954	Advanced Quality Control
5.955	Reliability and Maintainability Applications
5.956	Mathematical Theory of Reliability
5.957	Designing for Reliability

## **DESCRIPTION OF COURSES**

All courses carry two quarter hours of credit unless otherwise noted. Seminar and thesis may have varying credits established by the department at the time of registration.

5.801 Analysis of the Industrial Enterprise I

## **Enterprise I**      Prep. Bachelor of Science degree in Engineering or Science

A background for the practicing engineer: review of the history and growth of industrial enterprises; examination of the principles and foundation for sound enterprises; modern organizational precepts and practices; management attitude and training; close look at the product, development of a new product, marketing, advertising, and selling in domestic and foreign markets; the effect of good public relations and corporate image on the success of the industrial enterprise.

(Offered yearly, all quarters)

5.802 Analysis of the Industrial Enterprise II

Prep. 5.801, Analysis of  
the Industrial Enterprise I

The importance of modern planning and forecasting techniques; the effect of cybernation on the employee and the enterprise; the financial aspects of the corporation, the stock market and the interpretation of financial and business news; modern economics and its effect on business, government and community; the interrelationships of government and business.

(Offered yearly, all quarters)

**5.804 International Economics and Business**      Prep. 5.827, Basic  
Economics for Engineers

The significant economic systems of our times and of history including syndicalism, capitalism, socialism, fascism, and communism, considering the degree of government participation and control of resources.

(Offered yearly, Spring quarter)

**5.805 Industrial Budgeting for Engineers**      Prep. 5.810, Industrial  
Accounting or equivalent

Budgeting plans, programs, and reports for industry today; an introduction to the essentials of fixed and variable budgeting for production, inventory, sales, cash, capital, and cost-volume-profit analysis.

(Offered yearly, Fall quarter)

**5.806 Production Forecasting**      Prep. 5.951, Engineering Statistics II

Methods of forecasting the production of goods and materials for the firm, industry and national economy; special emphasis on techniques applicable to individual companies and products; some attention given to forecast of the gross national product and its principal components.

(Offered yearly, Spring quarter)

**5.808 Basic Engineering Economy**      Prep. Bachelor of Science degree  
in Engineering or Science

Economic analysis in formulating business policies and selecting alternatives from possible engineering solutions to industrial problems, present worth, annual cost and rate of return techniques with continuous and discrete interest calculations. Not open to Northeastern graduates who have completed 5.260, Engineering Economy, or 5.265, Fundamentals of Engineering Economy.

(Offered yearly, all quarters)

**5.809 Advanced Engineering Economy**      Prep. 5.808,  
Basic Engineering Economy

Principal emphasis on the practical application of the techniques studied in 5.808, Basic Engineering Economy; problems of implementation through class discussion of cases and a major term project; recent advances in the techniques of engineering economy, especially those relating to the consideration of uncertainties.

(Offered yearly, Spring quarter)

**5.810 Industrial Accounting for Engineers**      Prep. Bachelor of  
Science degree in Engineering or Science

Required of all students who have not had a basic course in accounting. Introduction of basic accounting principles and procedures; use of accounting data as a management tool; a practical coverage of basic cost procedures related to materials, labor, and manufacturing expense cost control; job order, process and standard cost systems.

(Offered yearly, all quarters)

**5.811 Cost Accounting for Engineers** Prep. 5.810, Industrial Accounting  
Cost accounting procedures as established by accountants are studied and evaluated in terms of being considered by the engineer for cost determination of alternative engineering proposals.

(Offered yearly, Winter quarter)

**5.812 Management of Technical Innovation** Prep. Bachelor of Science degree in Engineering or Science

Analysis of the particular problems of managing research, development and engineering based on current developments in general management theory and the behavioral sciences; technical innovation as part of the overall organization, selection, administration and evaluation of projects; administrative and supporting functions in the technical organization.

(Offered yearly, Fall and Winter quarters)

**5.813 Engineering Reports** Prep. Bachelor of Science degree in Engineering or Science

Principles for achieving a clear, readable style through appropriate word choice and modern concepts of sentence and paragraph structure; application and evaluation of these principles in engineering proposals, reports, manuals, and related documents; practice in utilizing artwork, setting up outlines, and adapting to various reader levels; class analysis of great engineering literature.

(Offered yearly, all quarters)

**5.814 Executive Development** Prep. 5.802, Analysis of the Industrial Enterprise II

The impact of new corporate dimensions — popular ownership; professional management; public responsibility; the customer; ethical standards; the challenge of top-range planning; information for decision making; human motivation; social-political questions impinging on the business community; managerial philosophies; decentralization and attendant problems; development of men; leading through persuasion not command; integration; teamwork; balanced communications; sharing the vision of the future.

(Offered yearly, Fall and Winter quarters)

**5.815 Legal Aspects of New Technology** Prep. Bachelor of Science degree in Engineering or Science

The relationship of laws and regulations to technical innovation and related corporate activities; emphasis on the patent and copyright systems; trade secrets; managing intellectual property as part of employer-employee relations; disposition of rights under federal contracts and grants.

(Offered yearly, Fall and Spring quarters)

**5.816 Industrial Psychology for Engineers** Prep. Bachelor of Science degree in Engineering or Science

A general coverage of the application of psychology to industry with emphasis on industrial environments and organization, human relations, group dynamics, tests and measurements, personnel practices, training, and motivation.

(Offered yearly, Fall and Winter quarters)

**5.817 Advanced Work Design** Prep. A work measurement course Basic philosophies of work design; implementation of work design concepts with case studies; study and analysis of models such as work sampling, sequence or flow of work models, repetitive and nonrepetitive work models; and work measurement models such as standard data; human factors in measuring operator performance; regression analysis approaches. (Offered yearly, Winter quarter)

**5.818 Management Information Systems** Prep. 5.810, Industrial Accounting and 5.913, Data Processing for Engineers or their equivalent A prior course in data processing is recommended.

The design and effective utilization of industrial information systems for management decision-making with emphasis on the integrated use of electronic computers in such systems; manual systems are considered where they are the only economic and feasible solution; effective data collection, reduction and storage are considered along with determining the appropriate information content to be summarized for intelligent decision-making. (Offered yearly, Fall and Spring quarters)

**5.819 Human Factors in Man-Machine Systems** Prep. Bachelor of Science degree in Engineering or Science

Design of equipment and systems for human use; emphasis on the application of engineering psychology; visual and auditory presentation of information, speech communications, man-machine dynamics, design of controls, layout of work places and environmental effects on human performance. (Offered yearly, Fall quarter)

**5.820 Personnel Administration for Engineers** Prep. Bachelor of Science degree in Engineering or Science

Personnel programs for attracting and retaining technical talent; evaluating effectiveness of major personnel policies; modern methods of salary and wage administration; planning profitable relationships among company, supervisors and employees. (Offered yearly, Winter quarter)

**5.821 Management and Labor Unions** Prep. Bachelor of Science degree in Engineering or Science

A survey of labor-management problems and trends for engineering students; examination of the variety of unions, their evolution, objectives, and regulations; contrast of the characteristics of unions with those of management as institutions; nature of collective bargaining; impact of technology on unions and on collective bargaining with emphasis on the increased direct and indirect participation of engineers professionally, or as executives in negotiations, administration and settlement of disputes. (Offered yearly, Spring quarter)

**5.822 Value Engineering** Prep. Bachelor of Science degree in Engineering or Science

Value analysis from point of view of design, manufacturability, procurement and installation, complete value analysis study, value tests, func-

tion-cost relationship, principles and procedures to optimize value in products.  
(Offered yearly, Winter quarter)

**5.823 Advanced Production Analysis** Prep. Bachelor of Science degree in Engineering or Science

A review of the classical techniques used in industrial engineering, investigation into refinements and extensions of these techniques in production as well as in other activities not typically associated with industrial engineering.

(Offered yearly, days only, Fall quarter. 4 Q.H. credits)

**5.824 Case Studies in Industrial Engineering** Prep. 5.823, Advanced Production Analysis

Case studies of successful and unsuccessful engineering analyses utilizing industrial engineering techniques; qualitative and quantitative techniques are used based on their suitability to the particular problem involved; some consideration of computer techniques in industrial engineering studies.

(Offered yearly, days only, Spring quarter. 4 Q.H. credits)

**5.827 Basic Economics for Engineers** Prep. Bachelor of Science degree in Engineering or Science

Macro-economics with emphasis on the technological problems developed by rapidly accelerating technology; use of economic indicators; comparison of major economic systems; influence of history on the American economy.  
(Offered yearly, Winter quarter)

**5.828 Industrial Marketing** Prep. Bachelor of Science degree in Engineering or Science

Introduction to managerial problems in marketing operations, emphasizing possibilities of gaining insight into the underlying determinants and dynamics of consumer and industrial demand behavior through the medium of social and economic research; basic policy considerations through which marketing management may adapt operations of firm to changing market environment; selection and control of channels of distribution, product line, pricing and sales promotion policy; theoretical concepts and quantitative techniques applied in study of marketing phenomena.  
(Offered yearly, Winter quarter)

**5.830 Financial Management I** Prep. 5.802, Analysis of the Industrial Enterprise II, and 5.810, Industrial Accounting for Engineers or equivalent

Study of the issues and processes of short-term financing of industrial firms; financial analysis of cases, supplemented by readings to develop familiarity with sources and uses of working capital as well as the goals and problems involved in its management. (Offered yearly, all quarters)

**5.831 Financial Management II**      Prep. 5.830, Financial Management I

Extension of Financial Management I with emphasis on analysis necessary to such long-term financial decisions as issuance of stock or bonds; contracting of leases or loans, and financing of a new enterprise; mergers, capital budgeting, the cost of capital, and the valuation of a business.

(Offered yearly, all quarters)

**5.840 Seminar on Management of Engineers**      Prep. 5.812 or 5.816  
or 5.820

(Limited to 15 students selected from  
preregistration applications)

Each student will prepare a term project on a subject of his choosing to be presented orally and in writing; discussions of current subjects led by instructor and guest speakers.

(Offered experimentally, 1967–68, Winter quarter)

**5.900 Basic Operations Research**      Prep. 5.951, Engineering Statistics II  
or 10.831, Probability

An introduction to the theory and use of deterministic and stochastic models to represent industrial operations. Models included are those of linear programming, dynamic programming, inventory control, waiting lines and Monte Carlo simulation.

(Offered yearly, day only, Fall quarter. 4 Q.H. credits)

**5.901 Basic Operations Research**      Prep. 5.951, Engineering Statistics II  
Evening equivalent to first half of 5.900, Basic Operations Research.  
(Offered yearly, all quarters)**5.902 Basic Operations Research**      Prep. 5.901,  
Basic Operations Research  
Evening equivalent to second half of 5.900, Basic Operations Research.  
(Offered yearly, all quarters)**5.903 Inventory Control and Production Planning**      Prep. 5.951,  
Engineering Statistics II or equivalent  
The design and operation of inventory systems from a scientific management point of view, including both required theory and practical aspects. Subjects include inventory control models, statistical forecasting, production scheduling techniques, distribution systems, management control and reports, discussion of actual systems and a case study.  
(Offered yearly, Spring quarter)**5.904 Queuing Theory and Its Applications**      Prep. 5.900 or 5.902,  
Basic Operations Research

A development of the theory of queues using the equations of detailed balance approach; study of models based on random arrivals including exponential and Erlang service distributions, single and multiple services,

series and parallel systems, and finite and infinite queues, applications to staffing inventory control, maintenance, and scheduling.

(Offered yearly, Winter quarter)

**5.905 Analysis with Simulation**

Prep. 5.913, Data Processing for Engineers

validity of simulation model; applications drawn from problems in in-processes, logic of simulation and flow graphing, and testing of the validity of simulation model; applications drawn from problems in inventory, marketing, job shop scheduling, and others.

(Offered yearly, Fall quarter)

**5.906 Industrial Dynamics**

Prep. Bachelor of Science degree in Engineering or Science

The concepts of industrial dynamics and feedback control theory; a term project to study dynamic management systems; steps in the problem-solving procedure of problem identification, causal hypothesis, model building, model analysis, model improvement, implementation and evaluation are treated in the feedback system context; amplification, cycle generation, lead-lag relationships and growth dynamics in management systems.

(Offered yearly, Spring quarter)

**5.911 Linear Programming**

Prep. 5.900, or 5.902, Basic Operations Research

Covers in depth techniques and theory contained in linear, quadratic, and nonlinear programming which would include sensitivity analysis, the dual theorem, parametric programming, and problems involving uncertainty.

(Offered yearly, Spring quarter)

**5.912 Network Planning and Control**

Prep. 5.913, Data Processing for Engineers

Applications of the theory of flow through networks to scheduling, planning, line balancing, transportation and materials handling, PERT and Critical Path Scheduling, case studies of successful and unsuccessful applications, computer and manual solutions utilized.

(Offered yearly, Spring quarter)

**5.913 Data Processing for Engineers**

Prep. Bachelor of Science degree in Engineering or Science

A study of digital computers and computer programming techniques as applied to management problems. The course will cover the basic characteristics and operation of computing equipment and peripheral devices. The FORTRAN language is presented in depth and will be utilized by the student for programming and running several projects on a computer. Other compiler languages will be described and compared to FORTRAN. A systems approach to the design, development, and implementation of computer programs for solving management problems will be emphasized. Examples will be studied from several management areas.

(Offered yearly, all quarters)

**5.914 Advanced Operations Research** Prep. 5.900, Basic Operations Research  
 Further study of quantitative techniques available to assist management in scientific decision-making, including Markov processes, utility theory, Bayesian statistics, and forecasting; case studies of real industrial problems.  
 (Offered yearly, day only, Spring quarter)

**5.915 Operations Research for Management** Prep. 5.900 or 5.902, Basic Operations Research  
 The executive as a problem-solver and decision-maker; statistical decision theory optimal decisions, and the value of information; executive judgment and subjective probabilities; operations research for the management decision process in concept and practice; industrial decision systems; applications in marketing, production, and finance. (Not recommended for those following the Operations Research Sequence.)  
 (Offered yearly, Fall quarter)

**5.916 Engineering Analysis Utilizing Data Processing** Prep. 5.913, Data Processing for Engineers  
 Engineering and quantitative management problems utilizing data processing equipment; problem formulation and adaptation to digital and/or analog equipment; economic evaluation of computer and ancillary equipment; case studies and a trip to an engineering applications computer installation.  
 (Offered yearly, Fall quarter)

**5.917 Information Retrieval** Prep. Bachelor of Science degree in Engineering or Science  
 Information retrieval concepts, systems and equipment, covering the fundamental aspects of linguistics, mathematics and logic; processes of subject analysis, indexing, classification, storage, search and retrieval, and output problems; lectures augmented by demonstrations and varying references to accommodate differing interests of students.  
 (Offered yearly, Fall quarter)

**5.950 Engineering Statistics I** Prep. Calculus  
 A brief though rigorous introduction to probability as foundation for statistics; discrete and continuous distributions such as the binomial, poisson, hypergeometric and normal; mean and variance; operations research; sampling distributions.  
 (Offered yearly, all quarters)

**5.951 Engineering Statistics II** Prep. 5.950, Engineering Statistics I  
 An introduction to the techniques of statistical inference; treatment of statistical data, inferences concerning means, variances and proportions, regression analysis, correlation and other statistical concepts.  
 (Offered yearly, all quarters)

**5.952 Design of Experiments** Prep. 5.951, Engineering Statistics II or 10.836, Mathematical Statistics  
Use and analysis of experimental designs such as randomized blocks and Latin squares; analysis of variance and covariance; factorial experiments; statistical problems associated with finding best operating conditions; response surface analysis. (Offered yearly, Fall quarter)

**5.953 Statistical Decision Theory** Prep. 5.951, Engineering Statistics II or 10.831, Probability  
Use of Bayesian statistical inference to arrive at decisions when stochastic variables are interacting; relationship to Game Theory; decision making over time in a sequence; important expected values and distributions; relationship of Bayesian decision theory to classical statistical inference. (Offered yearly, Fall quarter)

**5.954 Advanced Quality Control** Prep. 5.951, Engineering Statistics II  
Economics of quality, specification of quality, organization for quality, statistical methods of quality control; quality policies and objectives; personnel methods for quality; design of testing and inspection procedures; budgeting of quality programs; sampling by variables, sampling for life testing, continuous sampling.  
(Offered yearly, Winter quarter)

**5.955 Reliability and Maintainability Applications** Prep. 5.951, Engineering Statistics II or 10.831, Probability  
An introduction to reliability and maintainability engineering technology applied to system and circuit design; the "bath-tub" curve; stress de-rating of components; failure rate and repair rate prediction techniques and assessment; early failure, useful life and wearout characteristics.  
(Offered yearly, Fall quarter)

**5.956 Mathematical Theory of Reliability** Prep. 5.955, Reliability and Maintainability Applications  
Probability mathematical techniques utilized in systems reliability analysis; prediction; allocation and demonstration testing; reliability probability functions, active and standby redundancy with or without repair, spares planning, and availability.  
(Offered yearly, Winter quarter)

**5.957 Designing for Reliability** Prep. 5.955, Reliability and Maintainability Applications  
Oriented to the design of electronic systems; development of complex system reliability mathematical models; Markovian chain stochastic processes, matrix algebra applied to redundancy problems; flow-diagram techniques using Laplacian transforms, and queuing theory for repairable systems; system-effectiveness methods particularly those developed by Hunter and Barlow.  
(Offered yearly, Spring quarter)

**5.990 Seminar** Prep. 5.823, Advanced Production Analysis  
Capstone seminar to integrate graduate level courses; periodic distinguished outside speakers; graduate student and faculty presentation of research papers.

(Offered yearly, day only, Winter quarter. 4 Q.H. credits)

**5.991 Thesis (Master's Degree)** Prep. Bachelor of Science degree  
in Engineering or Science  
Analytical and/or experimental work conducted under the auspices of  
the department. (Offered yearly, day only, all quarters)



# *Mechanical Engineering*

## Admission

To be enrolled for graduate work leading to the degree of Master of Science in Mechanical Engineering, applicants must have obtained a Bachelor of Science degree in Mechanical Engineering from a recognized institution. Applicants with a bachelor's degree in other engineering or related science fields and an appropriate background of preparation may pursue this program and qualify for the degree of Master of Science without specification.

## THE MASTER'S DEGREE

### Full-Time Program on Co-operative Plan

Forty quarter hours of academic work are required. This program may be taken on a co-operative plan. On this plan, students take academic work in the Fall and Spring quarters of the first year and in the Winter quarter of the second year. The other three quarters of the two academic years and the summer after the first year are available for professional employment.

A thesis of ten quarter hours of credit is required unless waived by the department graduate committee.

Majors in Mechanics, Materials and Heat are available. The sequence of courses on the Co-operative Plan will normally be taken according to the following pattern:

### MECHANICS MAJOR

First Academic Quarter	Credits	Second Academic Quarter	Credits
2.803 Continuum Mechanics . . . . .	4	2.990 Seminar . . . . .	1
2.862 Systems Engineering . . . . .	4	2.991 Thesis . . . . .	5
		Electives . . . . .	8
10.803 or			
10.806 Advanced Mathematics . . . . .	4		14
	12		

Third Academic Quarter	Credits
2.990 Seminar . . . . .	1
2.991 Thesis . . . . .	5
Electives . . . . .	8
	14

**MATERIALS MAJOR**

<b>First Academic Quarter</b>	<b>Credits</b>	<b>Second Academic Quarter</b>	<b>Credits</b>
2.803 Continuum Mechanics .....	4	2.955 Advanced Physical Metallurgy .....	4
10.803 or		2.990 Seminar .....	1
10.806 Advanced Mathematics .....	4	2.991 Thesis .....	5
2.232 Physical Metallurgy or Electives .....	<u>4</u>	Electives .....	<u>4</u>
	<u>12</u>		<u>14</u>

<b>Third Academic Quarter</b>	<b>Credits</b>
2.990 Seminar .....	1
2.991 Thesis .....	5
Electives .....	<u>8</u>
	<u>14</u>

**HEAT MAJOR**

<b>First Academic Quarter</b>	<b>Credits</b>	<b>Second Academic Quarter</b>	<b>Credits</b>
2.803 Continuum Mechanics .....	4	2.912 Heat Transfer ....	4
2.903 Advanced Thermodynamics ..	4	2.990 Seminar .....	1
10.803 or		2.991 Thesis .....	5
10.806 Advanced Mathematics .....	<u>4</u>	Electives .....	<u>4</u>
	<u>12</u>		<u>14</u>

<b>Third Academic Quarter</b>	<b>Credits</b>
2.990 Seminar .....	1
2.991 Thesis .....	5
Electives .....	<u>8</u>
	<u>14</u>

Students may also take the program on a continuous full-time basis to complete the degree requirements in one academic year. The sequence of courses which students take on this plan is established by their advisor.

**Electives**

With the approval of the advisor, a maximum of ten quarter hours of credit may be elected from graduate courses in other departments.

## PART-TIME EVENING PROGRAMS

The admission requirements for these programs are the same as for the full-time program, but students may progress according to their abilities and the time available.

### Required Courses

Mechanics Major	Credits	Materials Major	Credits
10.801 or		10.801 or	
10.804 Advanced Mathematics ..... 2		10.804 Advanced Mathematics ..... 2	
10.802 or		10.802 or	
10.805 Advanced Mathematics ..... 2		10.805 Advanced Mathematics ..... 2	
2.801 Continuum Mechanics ..... 2		2.801 Continuum Mechanics ..... 2	
2.802 Continuum Mechanics ..... 2		2.802 Continuum Mechanics ..... 2	
2.860 Systems Engineering ..... 2		2.950 Physical Metallurgy I ..... 2	
2.861 Systems Engineering ..... <u>2</u>	<u>12</u>	2.951 Physical Metallurgy II ..... 2	
		2.953 Advanced Physical Metallurgy I ..... 2	
		2.954 Advanced Physical Metallurgy II ..... <u>2</u>	<u>16</u>

### Heat Major

Heat Major	Credits
10.801 or	
10.804 Advanced Mathematics ..... 2	
10.802 or	
10.805 Advanced Mathematics ..... 2	
2.801 Continuum Mechanics ..... 2	
2.802 Continuum Mechanics ..... 2	
2.901 Advanced Thermodynamics .. 2	
2.902 Advanced Thermodynamics .. 2	
2.910 Heat Transfer .... 2	
2.911 Heat Transfer .... <u>2</u>	<u>16</u>

### Electives

Thirty of the 40 quarter hours must be from mechanical engineering courses.

The remaining ten may be elected from any courses in engineering or science for which the student has the necessary preparation.

## THE DOCTOR'S DEGREE

The following material outlines the procedure for admission to the doctoral program and the steps necessary to qualify for the Ph.D. degree. For further information, applicants should write to the Chairman of the Department of Mechanical Engineering.

### Admission

Applicants who are enrolled as candidates for the degree of Master of Science in Mechanical Engineering at Northeastern University should apply in writing to the Chairman of the Department of Mechanical Engineering for admission to the doctoral program. Such application must be made by February first of the year in which they expect to receive the Master's degree. The Departmental Graduate Committee will examine the record of the applicant and decide whether or not he should be allowed to take the qualifying examination.

Applicants who are enrolled for graduate work at other institutions or who have completed the requirements for the Master's degree should write the Chairman of the Department for an application for an interview. This form, transcripts of all undergraduate and graduate work, together with three letters of recommendation must be transmitted to the Chairman of the Departmental Graduate Committee. The applicant will be notified of an interview time and, after the interview, will be advised if he will be invited to take the qualifying examination and if he should make formal application for admission to the doctoral program. The application for interview, transcripts, and letters of recommendation must be received by February first if the April qualifying examination is to be taken.

### Residence Requirement

After degree candidacy has been established, the residence requirement is satisfied by one year of full-time graduate work or by two years of half-time graduate work. However, a student should expect to spend at least two years, or the equivalent, in full-time graduate study beyond the requirements of the Master's degree.

### Degree Candidacy

Degree candidacy is established in accordance with the general Graduate Division regulations.

## Qualifying Examination

The qualifying examination in the Department of Mechanical Engineering is offered yearly in April. This examination consists of two three-hour written parts and three three-quarter hour oral parts. The written parts may be either open book or closed book at the discretion of the Committee. Areas covered by the written examination are as follows:

1. Thermodynamics and Heat Transfer
2. Mechanics, Solid and Fluid
3. Machine Design
4. Materials and Processing.

The oral parts of the qualifying examination are designed to test the applicant's grasp of the fundamentals of thermodynamics and mechanics, and his knowledge of the use and behavior of engineering materials.

The qualifying examination may be taken by a graduate student who expects to complete the requirements for his Master's degree within three months of the date of the qualifying examination as well as by a person who has already completed the requirements for the Master's degree. If the examination is failed, it may be repeated only once with permission of the Departmental Graduate Committee.

## Comprehensive Examination

The comprehensive examination is combined with the final oral examination and is given after the thesis has been completed and approved. This examination is based upon the subject matter and defense of the thesis.

## Course Requirements

Course requirements for each applicant will be determined by the Departmental Graduate Committee. Formal course work will be tailored to meet the individual student's objectives. A maximum of ten quarter-hour course credits may be taken before satisfactory completion of the qualifying examination.

## Thesis

After degree candidacy has been established, a candidate must complete a thesis which embodies the results of extended research and includes material suitable for publication.

The Departmental Graduate Committee may require the completion of certain course work before permitting thesis work to commence. A thesis committee will be appointed by the Chairman of the Department upon the recommendation of the Departmental Graduate Committee. The thesis committee will be kept informed of the progress of the thesis and will be responsible for initial approval of the thesis in its final form.

**Foreign Language**

A reading knowledge of two foreign languages is required. Proficiency in a language shall be determined in a manner prescribed by the Departmental Graduate Committee. The language requirement must be satisfied no later than one year before the time at which the degree is to be conferred.

**Final Oral Examination**

This examination is held in accordance with the general Graduate Division requirements.

**DESCRIPTION OF COURSES**

The following undergraduate courses which are given in the daytime, may be elected by graduate students.

**2.214 Experimental Stress Analysis**

Prep. Admission to the

Engineering Graduate Program

This course, offered to day students, embodies the material in 2.817, Strain Gauge Techniques and 2.818, Photoelasticity.

(Offered 1967-68, Spring quarter. 4 Q.H. credits)

**2.232 Physical Metallurgy**

Prep. Admission to the

Engineering Graduate Program

Offered to day students. Embodies the material in 2.950 and 2.951, Physical Metallurgy I and II.

(Offered 1967-68, Fall and Spring quarters. 4 Q.H. credits)

**GRADUATE COURSES**

All courses carry two quarter hours of credit unless otherwise noted. Courses carrying four quarter hours of credit are day courses. Seminar and thesis may have varying credits established by the department at the time of registration.

**2.801 Continuum Mechanics**

Prep. 10.802 or 10.804, Advanced

Mathematics or equivalent

Algebra and Calculus of Cartesian tensors, relation to vector analysis, curvilinear co-ordinates, stress in a continuum.

(Offered 1967-68, all quarters)

**2.802 Continuum Mechanics**

Prep. 2.801, Continuum Mechanics

Strain and Strain Rate in a continuum, governing equations for an elastic solid and a Newtonian Fluid. Some exact solutions.

(Offered 1967-68, all quarters)

**2.803 Continuum Mechanics**

Prep. 10.803 or 10.806, Advanced Mathematics or equivalent

This course, offered to day students, embodies the material in 2.801 and 2.802, Continuum Mechanics.

(Offered 1967-68, Fall quarter. 4 Q.H. credits)

**2.805 Theory of Elasticity**

Prep. 2.802, Continuum Mechanics

Stress and deformation analysis of elastic solids. Two-dimensional problems; stress concentration; thermal stress. Theory of torsion, prismatic and axial symmetric bars. Introduction to theory of plates, bending of thin plates.

(Offered 1967-68, Fall quarter)

**2.806 Theory of Elasticity**

Prep. 2.805, Theory of Elasticity

Method of finite differences. Numerical solutions; torsion problem; plate bending. Variational method and energy principles; minimum potential and complementary energy theorems. Introduction to dynamics of elastic solids; waves, vibrations.

(Offered 1967-68, Winter quarter)

**2.807 Theory of Elasticity**

Prep. 2.803, Continuum Mechanics

This course, offered to day students, embodies the material in 2.805 and 2.806, Theory of Elasticity.

(Offered 1967-68, Winter quarter. 4 Q.H. credits)

**2.809 Plasticity and Creep**

Prep. 2.950 and 2.951,

Physical Metallurgy I and II

Types of deformation, elasticity, plasticity, creep, mechanical equation of state, plastic flow under multi-axial stress, and elastic creep. Relationship of comparatively simple laboratory material tests to more complex service conditions will be emphasized.

(Offered 1967-68, Spring quarter)

**2.810 Advanced Mechanics of Materials**

Prep. Admission to

Engineering Graduate Program

Review of fundamental stress concepts; point stress and strain; differential equations of stress; elastic properties; theories of failure; transverse bending; shear stress distribution; shear center; bending stresses due to non-symmetrical bending; thick and thin cylinders under elastic and plastic deformation. Experimental methods and practical problems are discussed.

(Offered 1967-68, Fall quarter)

**2.811 Advanced Mechanics of Materials**

Prep. 2.810, Advanced

Mechanics of Materials

Analysis of statistically indeterminate beams and frames by slope, deflection and moment distribution techniques; stresses in curved beams, beams on elastic foundations; bending of flat plates; stability analysis of structural members; grid systems and other special topics to be selected by needs of the class.

(Offered 1967-68, Winter quarter)

**2.812 Advanced Mechanics of Materials**

Prep. Admission to

Engineering Graduate Program

This course, offered to day students, embodies the material in 2.810 and 2.811, Advanced Mechanics of Materials.

(Offered 1967-68, Winter quarter. 4 Q.H. credits)

**2.815 Plates and Shells**

Prep. 2.806, Theory of Elasticity

Bending of plates with various shapes, loads, and supports. Large deflection of plates. Membrane theory of shells. Analysis of cylindrical shells. General theory of thin elastic shells. Shells of revolution.

(Offered 1967-68, Fall quarter)

**2.817 Strain Gauge Techniques**Prep. Admission to Engineering  
Graduate Program

Theory and application of mechanical and electrical strain gauges. Installation, instrumentation and circuitry of gauge set-ups or transducer use and experimental stress analysis. Use of brittle coatings in experimental stress analysis.

(Offered 1967-68, Fall quarter)

**2.818 Photoelasticity**

Prep. 2.817, Strain Gauge Techniques

Theory and practice of photoelastic methods as applied to classical experimental stress analysis of models and as modified for use in photoelastic coatings.

(Offered 1967-68, Winter quarter)

**2.820 Fluid Dynamics**

Prep. 2.802, Continuum Mechanics

Vorticity and circulation. Kelvin and Helmholtz theorems. Potentials and stream functions; Biot-Savart Law. Bernoulli relations. Complex variable theory applied to the solution of potential flows. Theorems of Blasius and Kutta-Joukowski.

(Offered 1967-68, Spring quarter)

**2.821 Fluid Dynamics**

Prep. 2.820, Fluid Dynamics

Surface waves and conditions at an interface. Some exact solutions of the Navier-Stokes equations. Stokes flow. Fundamentals of boundary layer theory; separation. Introduction to turbulence and stability.

(Offered 1968-69, Fall quarter)

**2.822 Fluid Dynamics**

Prep. 2.803, Continuum Mechanics

This course, offered to day students, embodies the material in 2.820 and 2.821, Fluid Dynamics.

(Offered 1967-68, Spring quarter. 4 Q.H. credits)

**2.823 Gas Dynamics**

Prep. 2.821, Fluid Dynamics

Sound speed in a gas. Shock waves. Characteristics. One and two dimensional steady flows. One-dimensional unsteady flow. Small perturbation theory. Similarity rules, Hodograph methods.

(Not offered 1967-68)

**2.824 Gas Dynamics**

Prep. 2.823, Gas Dynamics

Continuation of 2.823, Gas Dynamics.

(Not offered 1967-68)

**2.825 Gas Dynamics** Prep. 2.822, Fluid Dynamics  
 This course, offered to day students, embodies the material in 2.823 and 2.824, Gas Dynamics.  
 (Offered 1967-68, Winter quarter. 4 Q.H. credits)

**2.830 Orbital and Ballistic Mechanics** Prep. Admission to the Engineering Graduate Program  
 Orbit mechanics, dealing with the two body problem of unpowered coasting flights, orbital transfers, staging theory.  
 (Offered 1967-68, Fall quarter)

**2.831 Orbital and Ballistic Mechanics** Prep. 2.830, Orbital and Ballistic Mechanics  
 Analysis of orbits aimed at specific missions such as Lunar, Venus and Mars — One and two-way trips.  
 (Offered 1967-68, Winter quarter)

**2.832 Orbital and Ballistic Mechanics** Prep. Admission to the Engineering Graduate Program  
 This course, offered to day students, embodies the material in 2.830 and 2.831, Orbital and Ballistic Mechanics.  
 (Offered 1967-68, Fall quarter. 4 Q.H. credits)

**2.834 Dynamics of Re-entry Vehicles** Prep. 2.830, Orbital and Ballistic Mechanics or equivalent  
 Rigid vehicle kinematics, basic vehicle dynamics, definition and transformation of various systems of axes associated with the vehicle motion, re-entry aerodynamic forces and heating, approximate solutions of entry dynamics, applications of fundamental theory of industrial problems on re-entry vehicle dynamics.  
 (Offered 1967-68, Winter quarter)

**2.835 Advanced Dynamics of Re-entry Vehicles** Prep. 2.834, Dynamics of Re-entry Vehicles  
 Continuation of 2.834, Dynamics of Re-entry Vehicles.  
 (Offered 1967-68, Spring quarter)

**2.836 Dynamics and Advanced Dynamics of Re-entry Vehicles** Prep. 2.832, Orbital and Ballistic Mechanics  
 This course, offered to day students, embodies the material in 2.834, Dynamics of Re-entry Vehicles and 2.835, Advanced Dynamics of Re-entry Vehicles.  
 (Not offered 1967-68. 4 Q.H. credits)

**2.837 Special Topics: Orbital and Ballistic Mechanics** Prep. 2.831, Orbital and Ballistic Mechanics  
 Low thrust vehicle analysis with emphasis on optimization, transfer between orbits, boost analysis.  
 (Offered 1967-68, Spring quarter)

**2.842 Vibration Theory and Applications** Prep. 2.861, Systems Engineering  
 Multiple degrees of freedom; free and forced vibrations with or without damping, extensional and torsional oscillations, frequency equation, energy in a vibrating system, energy methods of solution, Rayleigh's Method.  
 (Offered 1967-68, Spring quarter)

**2.843 Vibration Theory and Applications** Prep. 2.842, Vibration Theory and Applications  
 Continuation of 2.842 including systems with distributed mass and stiffness, shock and impact, balancing of rotating machinery, vibrations of beams and related structures.  
 (Offered 1968-69, Fall quarter)

**2.844 Vibration Theory and Applications** Prep. 2.862, Systems Engineering  
 This course, offered to day students, embodies material in 2.842 and 2.843, Vibration Theory and Applications.  
 (Offered 1967-68, Spring quarter. 4 Q.H. credits)

**2.845 Shock, Vibration and Noise Control** Prep. 2.843, Vibration Theory and Applications  
 Theoretical and practical considerations pertinent to the design and protection of structures and equipment subject to severe environments of transient shock, steady state vibration, random vibration, and acoustic noise.  
 (Offered 1967-68, Spring quarter)

**2.846 Non-Linear Vibrations** Prep. 2.843, Vibration Theory and Applications  
 Studies of various non-linear problems and the techniques used in solving them. Symmetrical and unsymmetrical systems. The Van der Pol-Kryloff-Bogoliuboff method as well as others will be discussed.  
 (Not offered 1967-68)

**2.847 Advanced Dynamics** Prep. Admission to the Engineering Graduate Program  
 Application of fundamental laws of motion. Dynamics of a particle, motion of a projectile, linear and angular momentum, impact, kinetic energy and work. Variable and constant mass systems. Vector notation is used.  
 (Offered 1967-68, Winter quarter)

**2.848 Advanced Dynamics** Prep. 2.847, Advanced Dynamics  
 Continuation of 2.847, Advanced Dynamics, includes Hamilton's Principle, Euler's Equation, rotation of a rigid body, gyroscopes, and dynamic problems using analog computer.  
 (Offered 1967-68, Spring quarter)

**2.849 Advanced Dynamics** Prep. Admission to the Engineering Graduate Program  
 This course, offered to day students, embodies the material in 2.847 and 2.848, Advanced Dynamics.  
 (Offered 1967-68, Fall quarter. 4 Q.H. credits)

**2.850 Automatic Control Engineering** Prep. 2.861, Systems Engineering  
 Basic methods for analyzing and designing linear feedback control systems. Formulation of transfer functions and block diagrams representing physical components and systems. Study of control action. Analysis and design by use of root-locus and frequency-domain techniques.

(Offered 1967-68, Fall quarter)

**2.851 Automatic Control Engineering** Prep. 2.850, Automatic Control Engineering

General theory of automatic control. Further consideration of linear systems including compensating methods and multiple-inputs. Techniques for the treatment of non-linear systems. Study of the details of components such as hydraulic and pneumatic servo valves, pneumatic power amplifiers, etc.

(Offered 1967-68, Winter quarter)

**2.852 Automatic Control Engineering** Prep. 2.862, Systems Engineering

This course, offered to day students, embodies the material in 2.850 and 2.851, Automatic Control Engineering.

(Offered 1967-68, Winter quarter. 4 Q.H. credits)

**2.853 Fundamentals of Instrumentation** Prep. Bachelor of Science Degree

Theoretical principles underlying the design and operation of instruments for measurement and/or control. Analysis of stimulus-response relations. Industrial instruments for measurement and control, including those based on pneumatic and electrical systems.

(Offered 1967-68, Winter quarter)

**2.854 Industrial Process Control** Prep. 2.853, Fundamentals of Instrumentation

Fundamental principles involved in automatic control of industrial processes. Economic considerations. Application of control instruments to obtain automatic control of temperature, pressure, fluid flow, liquid level, humidity, pH.

(Offered 1967-68, Spring quarter)

**2.860 Systems Engineering** Prep. Admission to Engineering Graduate Program

The modeling and analysis of physical systems. Vibration of mechanical systems with one degree of freedom including the free-body and energy methods of formulating the equations of motion. Free vibration of undamped multi-degree-of-freedom systems; influence coefficients; matrix notation and iteration. Mechanical network or mobility-diagram representations; block diagramming. Laplace transform techniques.

(Offered 1967-68, all quarters)

**2.861 Systems Engineering** Prep. 2.860, Systems Engineering

Continuation of 2.860. Transient analysis. Analog computation. Frequency response techniques.

(Offered 1967-68, all quarters)

**2.862 Systems Engineering**

Prep. Admission to

Engineering Graduate Program

This course, offered to day students, embodies the material in 2.860 and 2.861, Systems Engineering.

(Offered 1967-68, Fall and Winter quarters. 4 Q.H. credits)

**2.901 Advanced Thermodynamics**

Prep. Admission to

Engineering Graduate Program

A critical examination of equilibrium thermodynamics from a rigorous viewpoint emphasizing fundamental concepts including: equilibrium, heat and work; the first and second law of thermodynamics; energy; heat engines, simple systems and open systems.

(Offered 1967-68, Fall quarter)

**2.902 Advanced Thermodynamics**

Prep. 2.901, Advanced

Thermodynamics

Continuation of 2.901—including examination of temperature scales; entropy and availability; the phase rule, single component systems; thermodynamic relations. Consideration is also given to the ideal gas; chemical potential and thermodynamics of ideal gas mixtures.

(Offered 1967-68, Winter quarter)

**2.903 Advanced Thermodynamics**

Prep. Admission to

Engineering Graduate Program

This course, offered to day students, embodies the material in 2.901 and 2.902, Advanced Thermodynamics.

(Offered 1967-68, Fall quarter. 4 Q.H. credits)

**2.904 Special Topics in Advanced Thermodynamics**

Prep. 2.902,

Advanced Thermodynamics

Selected subjects of current interest in general thermodynamics, including: chemical reactions; the law of stable equilibrium, normal and special systems and the third law. Detailed analysis of the statistics of ensembles is also covered to emphasize the relationship between thermodynamics and statistical mechanics. (Offered 1967-68, Spring quarter)

**2.905 Cryogenic Engineering**

Prep. Admission to

Engineering Graduate Program

Designed to provide a familiarity with the general field of cryogenics, some of the principal uses of cryogenics, and the ways of obtaining and preserving an environment at a low temperature. Refrigeration, cycle analysis, heat exchanger design, insulation systems, properties of materials, instrumentation problems and applications will be discussed and studied. Problems will be assigned typical of those which are encountered in the field and laboratory.

(Offered 1967-68, Fall quarter)

**2.906 Cryogenic Engineering**

Prep. 2.905, Cryogenic Engineering

Continuation of 2.905 — Cryogenic Engineering.

(Offered 1967-68, Winter quarter)

**2.910 Heat Transfer** Prep. Elements of Heat Transfer  
 Basic laws of heat transfer; steady state heat conduction, systems with heat sources, transient heat conduction; graphical, numerical and analogical methods; thermal radiation, radiation combined with convection and conduction, radiation from gases.  
 (Offered 1967–68, all quarters)

**2.911 Heat Transfer** Prep. 2.910, Heat Transfer  
 Fundamentals of convection; dimensional analysis; Reynolds, Prandtl and Nusselt numbers; Reynolds analogy; elements of boundary layer theory; free convection, forced convection, boiling and condensation, heat transfer in high speed flow; heat exchangers.  
 (Offered 1967–68, Winter and Spring quarters)

**2.912 Heat Transfer** Prep. Admission to the Engineering Graduate Program  
 This course, offered to day students, embodies the material in 2.910 and 2.911, Heat Transfer.  
 (Offered 1967–68, Spring quarter. 4 Q.H. credits)

**2.920 Direct Energy Conversion** Prep. Admission to Engineering Graduate Program  
 The fundamental processes of direct energy conversion and their application to the design and operation of magneto hydrodynamic power generators, thermionic converters, fuel cells, and thermoelectric converters.  
 (Not offered 1967–68)

**2.921 Direct Energy Conversion** Prep. 2.920, Direct Energy Conversion  
 Continuation of 2.920.  
 (Not offered 1967–68)

**2.922 Direct Energy Conversion** Prep. Admission to the Engineering Graduate Program  
 This course, offered to day students, embodies the material in 2.920 and 2.921, Direct Energy Conversion.  
 (Offered 1967–68, Winter quarter. 4 Q.H. credits)

**2.923 Special Topics in Direct Energy Conversion** Prep. 2.921 or 2.922  
 Direct Energy Conversion  
 Irreversible thermodynamics. Unified theory of energy conversion.  
 (Not offered 1967–68)

**2.924 Thermodynamics of Propulsion** Prep. Admission to Engineering Graduate Program  
 Application of the physical principles of thermodynamics, fluid mechanics, and plasmas to the prediction of the behavior of propulsion devices. The fundamentals of mechanics and thermodynamics of fluid flow, boundary layer mechanics, and heat transfer are reviewed. Air-breathing engines and rocket engines are discussed in detail with emphasis on realistic applications to demonstrate how physical laws both describe and limit

the performance of particular devices. An introduction to plasmas. The fundamentals of electrical rocket propulsion.

(Offered 1967-68, Fall quarter)

**2.925 Thermodynamics of Propulsion** Prep. 2.924, Thermodynamics of Propulsion

Continuation of 2.924 — Thermodynamics of Propulsion.

(Offered 1967-68, Winter quarter)

**2.926 Thermodynamics of Propulsion** Prep. Admission to Engineering Graduate Program

This course, offered to day students, embodies the material in 2.924 and 2.925 — Thermodynamics of Propulsion.

(Offered 1967-68, Fall quarter. 4 Q.H. credits)

**2.927 Fundamentals of Combustion** Prep. 2.925 or 2.926, Thermodynamics of Propulsion

An introduction to the science of combustion. The fundamentals of gas reaction, combustion in pre-mixed gases, combustion without pre-mixing, and heat and mass transfer with chemical reactions are included.

(Offered 1967-68, Spring quarter)

**2.930 Pumps** Prep. Hydraulics

Deals mainly with centrifugal pumps, with brief references to other types; flow of fluids in pipes and conduits, system curves, pump head velocity diagrams and head development, efficiency; specific speed, net positive suction head, cavitation; affinity laws, selection of pumps to suit various operating conditions and methods of driving, parallel operation; automatic operation, types of construction and materials used, methods of priming centrifugal pumps, pumping of chemicals, oils, and sludges, special problems of pump installation and operation, water hammer in pump discharge lines.

(Offered 1967-68, Winter quarter)

**2.931 Fans and Blowers** Prep. Thermodynamics

Flow of air in pipes and ducts, fan characteristics and laws, various types of fan wheels, inlet and outlet connections, fan capacity control, fan selection and testing. Compression of air and gases, flow in pipes, head on blowers, performance curves, effect of changes in speed and inlet conditions, construction, regulation, selection, installation, and testing. Axial flow fans and blowers. Positive pressure blowers.

(Offered 1967-68, Spring quarter)

**2.935 Power Plant Economics and Design** Prep. Thermodynamics

An integrated study into the economic and design considerations for both isolated and central station systems.

(Offered 1967-68, Fall quarter)

**2.936 Power Plant Economics and Design**      Prep. 2.935, Power Plant Economics and Design  
Continuation of 2.935, Power Plant Economics and Design.  
(Offered 1967-68, Winter quarter)

**2.937 Power Plant Economics and Design**      Prep. Thermodynamics  
This course, offered to day students, embodies the material in 2.935, and 2.936, Power Plant Economics and Design.  
(Not offered 1967-68. 4 Q.H. credits)

**2.950 Physical Metallurgy I**      Prep. Undergraduate Physical Metallurgy  
Atomic structure and bonding. Atomic basis for elasticity. Anisotropic elastic behavior. Anelastic behavior. Equilibrium and non-equilibrium studies of 1, 2, and 3 component systems.  
(Offered 1967-68, Fall and Spring quarters)

**2.951 Physical Metallurgy II**      Prep. 2.950, Physical Metallurgy I  
Oxidation; corrosion; electrical and magnetic behavior.  
(Offered 1967-68, Fall and Winter quarters)

**2.952 Physical Metallurgy III**      Prep. 2.232 or 2.951,  
Physical Metallurgy II  
Theory of solid-solutions and intermetallic compounds; nucleation and growth; pearlitic, bainitic and martensitic transformations; tempering; metallurgy of stainless steels, cast irons and titanium alloys.  
(Offered 1967-68, Spring quarter)

**2.953 Advanced Physical Metallurgy I**      Prep. 2.232 or 2.951,  
Physical Metallurgy II  
Point defects; theory of diffusion equations, self-diffusion, and effect of concentration gradients. Application of above topics to annealing processes.  
(Offered 1967-68, Fall quarter)

**2.954 Advanced Physical Metallurgy II**      Prep. 2.953, Advanced Physical Metallurgy I  
Dislocation theory and application to mechanical behaviour of solids. Topics include yielding, solid-solution strengthening, second-phase strengthening, and strain hardening.  
(Offered 1967-68, Winter and Spring quarters)

**2.955 Advanced Physical Metallurgy**      Prep. 2.232 or 2.951,  
Physical Metallurgy II  
This course, offered to day students, embodies the material in 2.953 and 2.954, Advanced Physical Metallurgy.  
(Offered 1967-68, Spring quarter. 4 Q.H. credits)

**2.960 Process Metallurgy Fundamentals**      Prep. Engineering Materials  
Basic metallurgical thermodynamics encompassing 1st, 2nd, and 3rd laws, entropy, enthalpy, free energy, stoichiometric principles.  
(Offered 1967-68, Winter quarter)

**2.961 Process Metallurgy Application**

Prep. 2.960, Process

Metallurgy Fundamentals

The application of metallurgical thermodynamics to the process of melting, casting, hot and cold working, welding, and alloying including kinetics of reactions. Electrochemical reactions. Techniques for process and product evaluation.

(Offered 1967-68, Spring quarter)

**2.962 Process Metallurgy Fundamentals and Applications**

Prep. Engineering Materials

This course, offered to day students, embodies the course content offered in 2.960, Process Metallurgy Fundamentals and 2.961, Process Metallurgy Applications. (Offered 1967-68, Winter quarter. 4 Q.H. credits)

**2.965 Physical Ceramics**

Prep. 2.232 or 2.951, or Physical Chemistry or Solid State Physics

Introduction to ceramic fabrication processes. Characteristics of vitreous and crystalline solids, structural imperfections, and atomic mobility. Phase equilibria, nucleation, crystal growth, solid-state reactions, non-equilibrium phases, and effects on the resulting microstructure of ceramics.

(Offered 1967-68, Fall quarter)

**2.966 Physical Ceramics**

Prep. 2.965, Physical Ceramics

Discussion of effects of composition and microstructure on the thermal, mechanical, optical, electrical, and magnetic properties of ceramic materials.

(Offered 1967-68, Winter quarter)

**2.967 Physical Ceramics**Prep. 2.232 or Physical Chemistry  
or Solid State Engineering

This course, offered to day students, embodies the material in 2.965 and 2.966, Physical Ceramics. (Not offered 1967-68. 4 Q.H. credits)

**2.970 Material Science and Engineering**Prep. 2.232 or 2.951,  
Physical Metallurgy II

Principles underlying the structure and properties of solid materials. The relationships of these principles to the properties and to applications in structures and devices. Both macroscopic-phenomenological and electronic-molecular approaches will be used. Materials will include metals and alloys, semiconductors, and dielectrics. Typical subjects are atomic and electronic structures, ordering, imperfections, nucleation and crystal growth, bonding, anelasticity.

(Offered 1967-68, Fall quarter)

**2.971 Material Science and Engineering**Prep. 2.970, Material Science  
and Engineering

Continuation of 2.970 into additional topics such as thermal, electric, magnetic, and optical properties; applications of solid-state phenomena to achieve functions embodied in transducers, filters, amplifiers, energy converters, and so forth.

(Offered 1967-68, Winter quarter)

**2.972 Material Science and Engineering** Prep. 2.232 or equivalent  
This course, offered to day students, embodies the material in 2.970 and 2.971, Material Science and Engineering.  
(Not offered 1967-68. 4 Q.H. credits)

**2.974 Material Science and Engineering — Special Topics** Prep. 2.971, Material Science and Engineering  
Subjects will vary from year to year but may include mechanisms of strengthening, composite materials, application of computers to solving metallurgical problems, and x-ray diffraction.  
(Offered 1967-68, Spring quarter)

**2.975 Principles of X-Ray Diffraction** Prep. 2.232 or 2.950, Physical Metallurgy I or equivalent  
General properties of x-rays. X-Ray production and detection. Emission and absorption. Introduction to diffraction and factors influencing the intensities. Analysis of diffraction patterns.  
(Offered 1967-68, Fall quarter)

**2.976 Applications of X-Ray Diffraction** Prep. 2.975, Principles of X-Ray Diffraction  
Experimental methods. Applications, including: single crystal orientation, crystallite size measurement, preferred orientation, residual stresses, precision lattice-parameter measurement, phase-diagram determination, chemical analysis.  
(Offered 1967-68, Winter quarter)

**2.990 Mechanical Engineering Seminar** Prep. Admission to Master of Science Program  
Discussions by industrial leaders, faculty, and graduate students on various subjects. Open to day students only.  
(Offered yearly, Spring and Winter quarters)

**2.991 Thesis (Master's Degree)** Prep. Admission to Master of Science Program  
Analytical and/or experimental work conducted under the auspices of the Department. Open to day students only.  
(Offered yearly, Spring and Winter quarters)

**2.995 Thesis (Ph.D. Degree)** Prep. Admission to the Doctoral Program in Mechanical Engineering  
Theoretical and experimental work conducted under the supervision of the department. Open to day students only.  
(Offered yearly, all quarters)

# **Mathematics**

## **GRADUATE COURSES**

All courses carry two quarter hours of credit unless otherwise specified. Courses carrying three or four quarter hours of credits are offered in the day only.

The following courses are primarily for students in the engineering programs. These courses may not be used for credit toward the program in mathematics but may be taken in addition to the required course work in this field.

<b>10.801 Advanced Mathematics</b>	Prep. Differential Equations Series solution of differential equations; Legendre and Bessel functions; Laplace transforms; scalar and vector fields; gradient, divergence, and curl.
<b>10.802 Advanced Mathematics</b>	Prep. 10.801, Advanced Mathematics or equivalent Fourier series and integrals, orthogonal functions, boundary-value problems involving partial differential equations: wave equation, heat flow, Laplace equation.
<b>10.803 Advanced Mathematics</b>	Prep. Differential Equations Legendre and Bessel functions, Laplace transforms, Fourier integrals, boundary-value problems, introduction to matrix algebra. Credits: 4 quarter hours.
<b>10.804 Advanced Mathematics</b>	Prep. 10.802, Advanced Mathematics Matrix algebra, determinants, inversion of matrices, rank and equivalence, linear equations and linear dependence, vector spaces and linear transformations.
<b>10.805 Advanced Mathematics</b>	Prep. 10.804, Advanced Mathematics Further topics in matrices and vector spaces.

**10.806 Advanced Mathematics** Prep. Differential Equations

This course, offered to day students, embodies the material in 10.804 and 10.805, Advanced Mathematics.

Credits: 4 quarter hours. (Offered yearly, Fall and Winter quarters)

The following courses are offered for those who wish to enter the master's degree program in mathematics, but who fail to satisfy the admission requirements in algebra and/or advanced calculus. These courses will be taken in addition to the required course work in mathematics.

Students in other programs may use these courses for elective credit.

**10.811 Abstract Algebra** Prep. Differential and Integral Calculus  
(Offered yearly, Fall quarter)**10.812 Abstract Algebra** Prep. 10.811, Abstract Algebra  
(Offered yearly, Winter quarter)**10.813 Abstract Algebra** Prep. 10.812, Abstract Algebra  
The content of 10.811 and the first half of 10.812 is as follows: Groups, subgroups, normal subgroups, rings, ideals, integral domains, and fields. The content of the second half of 10.812 and 10.813 is as follows: Linear spaces, linear transformations, inner product spaces, systems of linear equations, and algebra of matrices.  
(Offered yearly, Spring quarter)**10.821 Advanced Calculus** Prep. Differential and Integral Calculus  
Functions of one independent variable; limits, continuity, differentiability. Properties of continuous functions on a closed bounded interval. Rolle's theorem and the mean-value theorem.  
(Offered yearly, Fall quarter)**10.822 Advanced Calculus** Prep. 10.821, Advanced Calculus  
Functions of several independent variables. Distance and open sets; limits, continuity. Properties of continuous functions on a closed bounded set. Differentiability and differentials, mean-value theorem, implicit function theorems, Jacobians and transformations.  
(Offered yearly, Winter quarter)**10.823 Advanced Calculus** Prep. 10.822, Advanced Calculus  
Sequences, sequences of functions, uniform convergence, series. Integration, line and surface integrals. (Offered yearly, Spring quarter)

The following courses may be used toward the degree requirements in mathematics and in all engineering and science fields.

**10.831 Probability** Prep. Differential and Integral Calculus  
Fundamentals of probability theory; discrete and continuous probability distributions, including binomial, Poisson, and normal; law of large numbers and central limit theorem.  
(Offered yearly, every quarter)

<b>10.832 Probability</b>	Prep. 10.831, Probability
Further study of probability distributions for one or more random variables. Special topics such as occupancy problems and Markov chains.	(Offered yearly, every quarter)
<b>10.834 Mathematical Statistics</b>	Prep. 10.831, Probability or equivalent
Fundamental statistical methods. Tests of significance and estimation based on large or small samples; simple correlation and linear regression.	(Offered yearly, Fall and Winter quarters)
<b>10.835 Mathematical Statistics</b>	Prep. 10.834, Mathematical Statistics Analysis of variance; further topics in statistical inference.
	(Offered yearly, Winter and Spring quarters)
<b>10.836 Mathematical Statistics</b>	Prep. 10.831, Probability or equivalent
This course, offered to day students, embodies the material in 10.834 and 10.835, Mathematical Statistics.	
Credits: 4 quarter hours.	(Offered yearly, Spring quarter)
<b>10.838 Stochastic Processes</b>	Prep. 10.832, Probability
Markov chains with discrete time parameter. Classification and limit properties, random walk, probability spaces for an infinite family of random variables. Kolmogorov's compatibility conditions. Conditional Expectations. Poisson processes, counting processes.	
	(Offered yearly, Spring quarter)
<b>10.841 Advanced Differential Equations</b>	Prep. 10.804, Advanced Mathematics or 10.823, Advanced Calculus
	(Offered 1967-68, Fall quarter)
<b>10.842 Advanced Differential Equations</b>	Prep. 10.841, Advanced Differential Equations
	(Offered 1967-68, Winter quarter)
<b>10.843 Advanced Differential Equations</b>	Prep. 10.913, Theory of Functions of a Real Variable
Credits: 4 quarter hours.	(Offered yearly, Spring quarter)
The following material is covered in 10.841 and 10.842, Advanced Differential Equations. It is also covered as a unit in 10.843, Advanced Differential Equations.	
Theory of the first-order differential equation and of systems of such equations; the linear second-order equation (initial-value and two-point boundary-value problems) with emphasis on the representation of solutions by means of eigen-functions. Applications to problems in physics.	

<b>10.844 Advanced Differential Equations</b>	Prep. 10.842, Advanced Differential Equations
Differential equations in the complex plane; topology of integral curves; non-linear differential equations; stability theory; applications.	(Offered 1967–68, Spring quarter)
<b>10.845 Partial Differential Equations</b>	Prep. 10.912, Theory of Functions of a Real Variable and 10.918, Theory of Functions of a Complex Variable, or consent of the instructor
	(Offered 1968–69, Fall quarter)
<b>10.846 Partial Differential Equations</b>	Prep. 10.845, Partial Differential Equations
	(Offered 1968–69, Winter quarter)
<b>10.847 Partial Differential Equations</b>	Prep. 10.846, Partial Differential Equations
	(Offered 1968–69, Spring quarter)
The content of courses 10.845, 10.846, and 10.847, Partial Differential Equations is the following: Study of first-order partial differential equations, then second-order equations. Transformation theory in the plane and space; methods of solution and properties of solutions of equations with initial and boundary conditions; existence and uniqueness problems.	
<b>10.848 Partial Differential Equations</b>	Prep. 10.913, Theory of Functions of a Real Variable, or consent of the instructor
Credits: 3 quarter hours.	(Offered yearly, Summer quarter)
<b>10.849 Partial Differential Equations</b>	Prep. 10.848, Partial Differential Equations
Credits: 3 quarter hours.	(Offered yearly, Winter quarter)
The content of courses 10.848, 10.849, Partial Differential Equations is the same as that of courses 10.845, 10.846, 10.847, Partial Differential Equations.	
<b>10.850 Nonlinear Differential Equations</b>	Prep. 10.844, Advanced Differential Equations
Nonlinear differential equations of the first order; systems of differential equations; singular points and stability; second-order nonlinear equations; results of Poincare and Lyapunov; problems in nonlinear mechanics.	(Offered 1968, Summer quarter)

<b>10.851 Integral Equations</b>	Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or equivalent (Offered yearly, Winter quarter)
<b>10.852 Integral Equations</b>	Prep. 10.851, Integral Equations (Offered yearly, Spring quarter)
<b>10.853 Integral Equations</b>	Prep. Advanced calculus The following material is covered in 10.851 and 10.852, Integral Equations. It is also covered as a unit in 10.853, Integral Equations. Integral equations of the first, second, and third kind; systems of orthogonal functions; infinite matrices, infinite linear and bi-linear forms, applications to boundary-value problems.
Credits: 4 quarter hours.	(Offered yearly, Spring quarter)
<b>10.854 Difference Equations</b>	Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or equivalent (Offered yearly, Fall quarter)
<b>10.855 Difference Equations</b>	Prep. 10.854, Difference Equations The content of 10.854 and 10.855, Difference Equations is the following: Formulation and solution of difference equations; approximate solution of engineering problems by finite-difference methods; relaxation techniques; stability and convergence of approximate methods; applications. (Offered yearly, Winter quarter)
<b>10.857 Calculus of Variations</b>	Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or equivalent (Offered yearly, Spring quarter)
<b>10.858 Calculus of Variations</b>	Prep. 10.857, Calculus of Variations The content of courses 10.857 and 10.858, Calculus of Variations is as follows: The concept of the first variation of a functional; the simplest variational problem; Euler's equation. Generalization to several variables. Hamilton-Jacobi theory. Sufficient conditions for extrema. Fields of extremals. Direct methods in variational problems. (Offered 1968-69, Fall quarter)

<b>10.861 Numerical Analysis</b>	Prep. 10.802 and 10.804, Advanced Mathematics, or linear algebra and advanced calculus Solutions of systems of linear algebraic equations by reduction and iterative methods. Solutions of algebraic and transcendental equations. (Offered yearly, Fall quarter)
<b>10.862 Numerical Analysis</b>	Prep. 10.861, Numerical Analysis Approximation and interpolation. Use of difference techniques in interpolation and quadrature. Approximation by series of orthogonal functions; rational approximation. (Offered yearly, Winter quarter)
<b>10.863 Numerical Analysis</b>	Prep. 10.862, Numerical Analysis Numerical solution of ordinary and partial difference equations, with emphasis on stability and accuracy of solutions. (Offered yearly, Spring quarter)
<b>10.865 Approximation Theory</b>	Prep. Advanced calculus, linear algebra and probability Various techniques for the approximation of given functions, including interpolation, rational approximation, and orthogonal functions. Applications to such problems as numerical integration and solution of differential equations. Credits: 4 quarter hours. (Offered yearly, Winter quarter)
<b>10.871 Matrix Analysis</b>	Prep. 10.802 and 10.804, Advanced Mathematics, or Linear Algebra and Advanced Calculus Solutions of systems of linear equations by direct and iterative methods; matrix inversion, characteristic values, canonical forms. (Offered Winter quarter)
<b>10.872 Matrix Analysis</b>	Prep. 10.871, Matrix Analysis Discussion of Hermitian, orthogonal, and unitary matrices and their physical significance. Functions of matrices and matrix calculus. (Offered Spring quarter)
<b>10.873 Matrix Analysis</b>	Prep. Linear Algebra and Advanced Calculus This course, offered to day students, embodies the material in 10.871 and 10.872, Matrix Analysis. Credits: 4 quarter hours. (Offered yearly, Winter quarter)

<b>10.876 Tensor Analysis</b>	Prep. 10.802 and 10.804, Advanced Mathematics or 10.823, Advanced Calculus or equivalent
Tensor algebra; review of three-dimensional point and vector spaces in the setting of tensor analysis. Linear algebra and n-dimensional affine space. The coordinate tensor, tensor products, invariants, physical components.	(Offered 1967-68, Fall quarter)
<b>10.877 Tensor Analysis</b>	Prep. 10.876, Tensor Analysis
Symmetric and alternating tensors, rank and support, duality. The metric tensor. Tensor calculus: curvilinear coordinates, tangent spaces.	(Offered 1967-68, Winter quarter)
<b>10.878 Tensor Analysis</b>	Prep. 10.877, Tensor Analysis
Tensor fields, covariant derivative. Riemannian geometry, geodesics, curvature tensor. Parallel displacement, linear connections, exterior forms.	(Offered 1967-68, Spring quarter)
<b>10.901 General Topology</b>	Prep. 10.823, Advanced Calculus or equivalent
Credits: 4 quarter hours.	(Offered yearly, Fall quarter)
<b>10.902 General Topology</b>	Prep. 10.901, General Topology
The following material is covered in 10.901 and 10.902, General Topology. Sets and maps, metric spaces, topological spaces, separation axioms, compactness, connectedness.	(Offered 1967, Summer quarter)
<b>10.905 Complex Analysis</b>	Prep. Advanced Calculus
Analytic functions, conformal mapping, applications to fluid flow and electrostatic potential problems.	
Credits: 4 quarter hours.	(Offered yearly, Fall quarter)
<b>10.906 Complex Analysis</b>	Prep. 10.905, Complex Analysis
Integration; further topics in theory, including singularities and residues; and further applications.	
Credits: 4 quarter hours.	(Offered yearly, Spring quarter)
<b>10.907 Algebraic Topology</b>	Prep. 10.913, Theory of Functions of a Real Variable and 10.924, Algebra, or equivalent
Credits: 4 quarter hours.	(Offered yearly, Fall quarter)
<b>10.908 Algebraic Topology</b>	Prep. 10.907, Algebraic Topology
The content of the above two courses is as follows: Homology groups, homology sequences, homotopy theory, fiber spaces, sheaves.	
Credits: 4 quarter hours.	(Offered yearly, Winter quarter)

**10.917 Theory of Functions of a Complex Variable** Prep. 10.913,  
 General Topology  
 Lebesgue measure on real line, Measurable functions, Lebesgue Integral, convergence theorems, bounded variation, absolute continuity.  
 (Offered yearly, Winter quarter)

**10.912 Theory of Functions of a Real Variable** Prep. 10.911,  
 Theory of Functions of a Real Variable  
 Classical Banach Spaces, integration theory on abstract measure spaces, signed measures, Radon-Nikodym Theorem, Product measure, Fubini Theorem.  
 (Offered yearly, Spring quarter)

**10.913 Theory of Functions of a Real Variable** Prep. Advanced Calculus  
 Sets, relations, Zorn's lemma. Metric and topological spaces. Continuous mappings. Product and quotient spaces. Hausdorff, compact and connected spaces. Complete metric spaces; uniformly continuous mappings. Abstract Integral and measure.  
 Credits: 4 quarter hours. (Offered yearly, Fall quarter)

**10.914 Theory of Functions of a Real Variable** Prep. 10.913, Theory of Functions of a Real Variable  
 Integrable and measurable functions. Product Integral and Fubini's Theorem. Signed integrals; absolute continuity and the Radon-Nikodym Theorem  $L^p$  spaces.  
 Credits: 4 quarter hours. (Offered yearly, Winter and Spring quarters)

**10.915 Theory of Functions of a Complex Variable** Prep. 10.901,  
 General Topology  
 (may be taken concurrently)  
 Geometry of the complex plane, analytic functions, Cauchy's theorem.  
 (Offered yearly, Fall quarter)

**10.916 Theory of Functions of a Complex Variable** Prep. 10.915,  
 Theory of Functions of a Complex Variable  
 Infinite sequences and series, singularities, residues, applications.  
 (Offered yearly, Winter quarter)

**10.917 Theory of Functions of a Complex Variable** Prep. 10.913,  
 Theory of Functions of a Real Variable  
 Credits: 4 quarter hours. (Offered yearly, Fall quarter)  
 This course, offered to day students, embodies the course content of 10.915 and 10.916, Theory of Functions of a Complex Variable.

**10.918 Theory of Functions of a Complex Variable** Prep. 10.916,  
 Theory of Functions of a Complex Variable  
 Meromorphic functions, Mittag-Leffler theorem, conformal mapping.  
 (Offered yearly, Spring quarter)

<b>10.919 Theory of Functions of a Complex Variable</b>	Prep. 10.918, Theory of Functions of a Complex Variable Analytic continuation, Riemann surfaces, doubly periodic functions. (Offered 1968–69, Fall quarter)
<b>10.920 Theory of Functions of a Complex Variable</b>	Prep. 10.917, Theory of Functions of a Complex Variable This course, offered to day students, embodies the material in 10.918 and 10.919, Theory of Functions of a Complex Variable. Credits: 4 quarter hours. (Offered yearly, Winter quarter)
<b>10.921 Advanced Complex Functions</b>	Prep. 10.920, Theory of Functions of a Complex Variable Advanced topics in the theory of functions of a complex variable. Credits: 4 quarter hours. (Offered in alternate years, Spring quarter)
<b>10.924 Algebra</b>	Prep. One semester of modern algebra (Offered yearly, Fall quarter)
Credits: 3 quarter hours.	
<b>10.925 Algebra</b>	Prep. 10.924, Algebra (Offered yearly, Winter quarter)
Credits: 3 quarter hours.	
<b>10.926 Algebra</b>	Prep. 10.925, Algebra (Offered yearly, Spring quarter)
Credits: 3 quarter hours.	
The content of courses 10.924, 10.925, 10.926, Algebra is as follows: Group theory, Galois theory, unique factorization domains, Noetherian rings, modules, multilinear algebra.	
<b>10.930 Topics in Analysis</b>	Prep. 10.914, Theory of Functions of a Real Variable and Consent of the Instructor Selected advanced topics in analysis. Credits: 4 quarter hours. (Offered in alternate years, Winter quarter)
<b>10.931 Functional Analysis</b>	Prep. 10.914, Theory of Functions of a Real Variable (Offered yearly, Spring quarter)
Credits: 4 quarter hours.	
<b>10.932 Functional Analysis</b>	Prep. 10.931, Functional Analysis (Offered in alternate years, Fall quarter)
Credits: 4 quarter hours.	
The content of courses 10.931, 10.932, Functional Analysis is as follows: Topological vector spaces, Banach spaces, Hilbert spaces, Banach algebras, algebras of operations; representations.	
<b>10.933 Ergodic Theory</b>	Prep. 10.914, Theory of Functions of a Real Variable (Offered in alternate years, Fall quarter)
Credits: 4 quarter hours.	

<b>10.934 Ergodic Theory</b>	Prep. 10.933, Ergodic Theory Credits: 4 quarter hours. (Offered in alternate years, Winter quarter)
The content of courses 10.933, 10.934, Ergodic Theory is as follows: Measurable transformations. Ergodic theorems and their generalizations, classification of measure-preserving transformations, entropy and other isomorphism invariants.	
<b>10.935 Advanced Probability Theory</b>	Prep. 10.914, Theory of Functions of a Real Variable Probability spaces, random variables, distribution functions and characteristic functions. Convergence and stability of sums of independent random variables. Central limit problem. Conditional expectation. Martingales. Credits: 4 quarter hours. (Offered in alternate years, Fall quarter)
<b>10.936 Advanced Stochastic Processes</b> Prep. 10.935, Advanced Probability Theory Random walk: classification and limit properties. Hitting probabilities, Markov processes, strong Markov processes, Markov semigroups, sample continuity and diffusion operators. Credits: 4 quarter hours. (Offered in alternate years, Winter quarter)	
<b>10.941 Functions of Several Complex Variables</b>	Prep. 10.920, Theory of Functions of a Complex Variable and 10.908, Algebraic Topology Credits: 3 quarter hours. (Offered in alternate years, Winter quarter)
<b>10.942 Functions of Several Complex Variables</b>	Prep. 10.941, Functions of Several Complex Variables Credits: 3 quarter hours. (Offered in alternate years, Spring quarter)
The content of courses 10.941 and 10.942, Functions of Several Complex Variables is as follows: Holomorphic functions, topology of the space of holomorphic functions, holomorphy domains, Levi convexity theory.	
<b>10.951 Finite Groups</b>	Prep. 10.926, Algebra Credits: 4 quarter hours. (Offered in alternate years, Fall quarter)
<b>10.952 Finite Groups</b>	Prep. 10.951, Finite Groups Credits: 4 quarter hours. (Offered in alternate years, Winter quarter)
The content of courses 10.951 and 10.952, Finite Groups is as follows: Theory of solvable and nilpotent groups, permutation groups, transfer, p groups, representations of groups, group characters.	
<b>10.953 Lie Algebras</b>	Prep. 10.952, Finite Groups The structure of semi-simple complex lie algebras. Credits: 4 quarter hours. (Offered in alternate years, Fall quarter)

<b>10.954 Theory of Rings</b>	Prep. 10.926, Algebra
Rings with minimal condition, simple rings, Wedderburn theorem, representation of rings.	
Credits: 4 quarter hours.	(Offered in alternate years, Spring quarter)
<b>10.955 Advanced Lie Algebras</b>	Prep. 10.953, Lie Algebras
Credits: 4 quarter hours.	(Offered in alternate years, Winter quarter)
<b>10.956 Advanced Lie Algebras</b>	Prep. 10.955, Advanced Lie Algebras
Credits: 4 quarter hours.	(Offered in alternate years, Spring quarter)
The content of courses 10.955 and 10.956 is as follows: Advanced topics in the Theory of Lie Algebras.	
<b>10.960 Homological Algebra</b>	Prep. 10.926, Algebra
Topics in homology such as modules, diagrams, functors, complexes, extensions, Ext, Tor, Hom, and the cohomology theory of groups.	
Credits: 4 quarter hours.	(Offered in alternate years, Winter quarter)
<b>10.970 Lie Groups</b>	Prep. 10.913 Theory of Functions of a Real Variable
Analytic manifolds, infinitesimal transformations and differential forms, topological groups, local groups, Lie groups, Lie algebra of a Lie group, exponential mapping, algebra of differential forms, Lie's fundamental theorems, homomorphisms, universal covering group.	
Credits: 4 quarter hours.	(Offered in alternate years, Spring quarter)
<b>10.973 Topological Vector Spaces</b>	Prep. 10.914, Theory of Functions of a Real Variable
Complete metrizable topological vector spaces; Banach-Steinhaus theorem; open mapping theorem. Locally convex topological vector spaces; Hahn-Banach theorem. Duality, weakened topologies. Spaces of continuous linear mappings. Criteria of compactness.	
Credits: 4 quarter hours.	(Offered in alternate years, Winter quarter)
<b>10.976 Differentiable and Analytic Manifolds</b>	Prep. 10.920, Theory of Functions of a Complex Variable and 10.908, Algebraic Topology
Real and complex manifolds, tangent spaces, differential forms, integration.	
Credits: 4 quarter hours.	(Offered in alternate years, Spring quarter)
<b>10.990 Seminar</b>	Prep. Consent of the department
Investigation of selected topics through the study of journal articles.	
	(Offered yearly, Spring and Summer quarters)



**10.992 Readings in Analysis** Prep. Consent of the department

Supervised reading in selected topics in analysis.

Credits: 4 quarter hours.

(Offered yearly, Fall, Winter, and Spring quarters)

**10.993 Readings in Algebra** Prep. Consent of the department

Supervised reading in selected topics in algebra.

Credits: 4 quarter hours.

(Offered yearly, Fall, Winter, and Spring quarters)

**10.994 Readings in Topology** Prep. Consent of the department

Supervised reading in selected topics in topology.

Credits: 4 quarter hours.

(Offered yearly, Fall, Winter, and Spring quarters)

**10.995 Doctoral Thesis**

Prep. Admission to Ph.D. program

(Offered yearly, every quarter)

# *Physics*

## DESCRIPTION OF COURSES

<b>11.801 Introductory Modern Physics I</b>	Prep. Admission to science or engineering graduate program (Offered yearly, Fall quarter)
Credits: 2 quarter hours.	
<b>11.802 Introductory Modern Physics II</b>	Prep. 11.801, Introductory Modern Physics I
Credits: 2 quarter hours.	(Offered yearly, Winter quarter)
<b>11.803 Introductory Modern Physics III</b>	Prep. 11.802, Introductory Modern Physics II
The courses in Introductory Modern Physics carry graduate credit, but may not be used in satisfying the stated requirements for the master's degree in physics.	
The content of the above three courses is a study of the breakdowns of the classical laws of physics, review of important twentieth-century experiments showing the quantum aspects of radiation and matter, introduction to special relativity, the discovery of the electron, the nuclear atom, the radiation paradox, the Bohr theory of hydrogen and the inner shells of heavy atoms, wave aspects of matter, and Schroedinger's wave mechanics.	
Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.811 Mathematical Physics</b>	Prep. Admission to science or engineering graduate program (Offered yearly, Fall quarter)
Credits: 2 quarter hours.	
<b>11.812 Mathematical Physics</b>	Prep. 11.811, Mathematical Physics (Offered yearly, Winter quarter)
Credits: 2 quarter hours.	
<b>11.813 Mathematical Physics</b>	Prep. 11.812, Mathematical Physics
The content of the above three courses is an introduction to mathematical methods of theoretical physics. Topics to be covered include vector spaces, eigenfunction expansions, special functions of mathematical physics, theory of functions of a complex variable, differential and integral equations, generalized functions, Green's functions, partial differential equations, perturbation theory, and selected applications.	
Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.814 Mathematical Physics</b>	Prep. Admission to science or engineering graduate program (Offered yearly, Fall quarter)
Credits: 4 quarter hours.	

<b>11.815 Mathematical Physics</b>	Prep. 11.814, Mathematical Physics
These two courses cover essentially the same material as 11.811, 11.812, and 11.813 Mathematical Physics.	
Credits: 3 quarter hours.	(Offered yearly, Winter quarter)
<b>11.821 Classical Mechanics</b>	Prep. Admission to science or engineering graduate program
Credits: 2 quarter hours.	(Offered yearly, Fall quarter)
<b>11.822 Classical Mechanics</b>	Prep. 11.821, Classical Mechanics
Credits: 2 quarter hours.	(Offered yearly, Winter quarter)
<b>11.823 Classical Mechanics</b>	Prep. 11.822, Classical Mechanics
The content of the above three courses is Newton's laws of motion, constraints and D'Alembert's principles, Lagrange's equations, Hamilton's variational principle, central force motion, Hamilton's canonical equations, coupled oscillations, rigid body motion, Hamiltonian formulation of mechanics, canonical transformations, Hamilton-Jacobi theory, action-angle variables, classical perturbation theory.	
Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.824 Classical Mechanics</b>	Prep. Admission to science or engineering graduate program
Credits: 3 quarter hours.	(Offered yearly, Fall quarter)
<b>11.826 Classical Mechanics</b>	Prep. 11.824, Classical Mechanics
The content of the above two courses is essentially the same as 11.821, 11.822, 11.823 Classical Mechanics.	
Credits: 3 quarter hours.	(Offered yearly, Spring quarter)
<b>11.827 Statistical Mechanics</b>	Prep. 11.843, Quantum Theory III (may be taken concurrently)
Credits: 3 quarter hours.	(Offered 1968-69, Fall quarter)
<b>11.828 Statistical Mechanics</b>	Prep. 11.827, Statistical Mechanics
Credits: 3 quarter hours.	(Offered 1968-69, Winter quarter)
<b>11.829 Statistical Mechanics</b>	Prep. 11.828, Statistical Mechanics
The content of the above three courses is a study of the basics of thermodynamics, density matrix and partition function for the canonical and grand canonical ensembles and their connection with thermodynamic functions, application to specific examples, fluctuations, and irreversible processes.	
Credits: 3 quarter hours.	(Offered 1968-69, Spring quarter)
<b>11.831 Electromagnetic Theory</b>	Prep. Admission to science or engineering graduate program
Credits: 2 quarter hours.	(Offered yearly, Fall quarter)
<b>11.832 Electromagnetic Theory</b>	Prep. 11.831, Electromagnetic Theory
Credits: 2 quarter hours.	(Offered yearly, Winter quarter)

<b>11.833 Electromagnetic Theory</b>	Prep. 11.832, Electromagnetic Theory The content of the above three courses is electrostatics, boundary value problems, Green's functions and orthogonal function expansion, electrostatics of dielectric media, magnetostatics, time varying fields, Maxwell's equations, energy and momentum of the electromagnetic field, boundary conditions, plane waves, Fourier analysis, radiation of electromagnetic waves.	Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.834 Electromagnetic Theory</b>	Prep. Admission to science or engineering graduate program	Credits: 3 quarter hours.	(Offered yearly, Fall quarter)
<b>11.835 Electromagnetic Theory</b>	Prep. 11.834, Electromagnetic Theory The content of the above two courses is the same as 11.831, 11.832, 11.833, Electromagnetic Theory.	Credits: 3 quarter hours.	(Offered yearly, Winter quarter)
<b>11.836 Electromagnetic Theory</b>	Prep. 11.835, Electromagnetic Theory Irreducible multipole expansion of the electromagnetic field; introduction to special relativity, radiation from high-speed particles.	Credits: 3 quarter hours.	(Offered yearly, Spring quarter)
<b>11.837 Electromagnetic Theory</b>	Prep. 11.836, Electromagnetic Theory Advanced topics in electromagnetic theory such as problems involving radiation reaction, energy, momentum and the equations of motion of a high-speed particle, Cerenkov radiation, the Lagrangian and Hamiltonian formulation of electromagnetism.	Credits: 3 quarter hours.	(Offered 1968-69, Fall quarter)
<b>11.838 General Relativity I</b>	Prep. 11.837, Electromagnetic Theory and 11.823 or 11.826, Classical Mechanics	Credits: 3 quarter hours.	(Offered 1968-69, Winter quarter)
<b>11.839 General Relativity II</b>	Prep. 11.838, General Relativity I The content of the above two courses is a brief survey of differential geometry, physical basis of the Einstein equations, simple solutions and experimental tests, cosmology, asymptotic properties of the Einstein equations (radiation, energy, momentum), quantization of the theory.	Credits: 3 quarter hours.	(Offered 1968-69, Spring quarter)
<b>11.841 Quantum Theory I</b>	Prep. 11.821 or 11.824, Classical Mechanics and 11.813 or 11.815 Mathematical Physics (may be taken concurrently)	Credits: 4 quarter hours.	(Offered yearly, Fall and Winter quarters)

<b>11.842 Quantum Theory II</b>	Prep. 11.841, Quantum Theory I and 11.823 or 11.826, Classical Mechanics (may be taken concurrently)
Scattering problems, Born approximation, plane shift analysis, introduction to S-matrix theory, general vector space formulation of quantum mechanics.	
Credits: 4 quarter hours.	(Offered yearly, Winter and Spring quarters)
<b>11.843 Quantum Theory III</b>	Prep. 11.842, Quantum Theory II
Time independent perturbation theory (non-degenerate and degenerate), time dependent perturbation theory, semi-classical theory of radiation, Pauli wave equation.	
Credits: 4 quarter hours.	(Offered yearly, Fall and Spring quarters)
<b>11.844 Quantum Theory IV</b>	Prep. 11.843, Quantum Theory III
Credits: 3 quarter hours.	(Offered yearly, Winter quarter)
<b>11.845 Quantum Theory V</b>	Prep. 11.844, Quantum Theory IV
The above two courses provide a study of the special topics in non-relativistic and relativistic quantum mechanics, Dirac wave equations, addition of angular momentum problems.	
Credits: 3 quarter hours.	(Offered yearly, Spring quarter)
<b>11.851 Plasma Physics I</b>	Prep. 11.832, Electromagnetic Theory
Motion of charged particles in electromagnetic fields, propagation of electromagnetic waves in ionized gases, elementary theory of plasma, Boltzmann equation for plasma, fundamentals of magnetohydrodynamics.	
Credits: 2 quarter hours.	(Offered 1967-68, Fall quarter)
<b>11.852 Plasma Physics II</b>	Prep. 11.851, Plasma Physics I
Application of MHD to plasma confinement, motions of plasma across and along magnetic lines of force, plasma oscillations, waves in magnetoplasma, dispersion relations, nonlinearities in plasma.	
Credits: 2 quarter hours.	(Offered 1967-68, Winter quarter)
<b>11.853 Plasma Physics III</b>	Prep. 11.852, Plasma Physics II
Fodder-Planck equations for plasma, plasma conductivity, run-away electrons, relaxation times, radiation from plasma, stability theories, relativistic plasma.	
Credits: 2 quarter hours.	(Offered 1967-68, Spring quarter)
<b>11.861 Introductory Nuclear Physics I</b>	Prep. A one-year (undergraduate) course in modern (atomic and nuclear) physics
Basic description of nuclei, radioactivity, nuclear detectors.	
Credits: 2 quarter hours.	(Offered yearly, Fall quarter)
<b>11.862 Introductory Nuclear Physics II</b>	Prep. 11.861, Introductory Nuclear Physics I
Static properties of nuclei, nuclear models, nuclear transitions.	
Credits: 2 quarter hours.	(Offered yearly, Winter quarter)

<b>11.863 Introductory Nuclear Physics III</b>	Prep. 11.862, Introductory Nuclear Physics II Nuclear reactions, high-energy physics, elementary particles. Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.864 Theoretical Nuclear Physics I</b>	Prep. 11.843, Quantum Theory III (may be taken concurrently) Theoretical interpretation of the experimental data concerning the nucleon-nucleon interaction. Topics such as the variety of nucleon-nucleon scattering experiments, phase shift analysis, potential and other phenomenological models, and meson theory will be discussed. Credits: 3 quarter hours.	(Offered 1967-68, Fall quarter)
<b>11.865 Theoretical Nuclear Physics II</b>	Prep. 11.864, Theoretical Nuclear Physics I Nuclear models. The shell model, the collective model and the optical model will be considered. Credits: 3 quarter hours.	(Offered 1967-68, Winter quarter)
<b>11.866 Theoretical Nuclear Physics III</b>	Prep. 11.865, Theoretical Nuclear Physics II Special topics which may vary from year to year, such as beta-decay, nuclear reactions, electromagnetic interactions with nuclei and high energy scattering phenomena. Credits: 3 quarter hours.	(Offered 1967-68, Spring quarter)
<b>11.871 Introductory Solid-State Physics I</b>	Prep. A one-year (undergraduate) course in modern (atomic and nuclear) physics An introduction to the electrical and magnetic properties of matter. Credits: 2 quarter hours.	(Offered yearly, Fall quarter)
<b>11.872 Introductory Solid-State Physics II</b>	Prep. 11.871, Introductory Solid State Physics I A continuation of the electrical and magnetic properties plus the optical properties of matter. Credits: 2 quarter hours.	(Offered yearly, Winter quarter)
<b>11.873 Introductory Solid-State Physics III</b>	Prep. 11.872, Introductory Solid State Physics II The thermal properties of matter. Credits: 2 quarter hours.	(Offered yearly, Spring quarter)
<b>11.874 Solid-State Physics I</b>	Prep. 11.843, Quantum Theory III (may be taken concurrently) Selected topic in the quantum theory of solids. The band theory of metals. Credits: 3 quarter hours.	(Offered 1967-68, Fall quarter)

<b>11.875 Solid-State Physics II</b>	Prep. 11.874, Solid State Physics I A continuation of the band theory of metals plus semi-conduction and ionic crystals.
Credits: 3 quarter hours.	(Offered 1967-68, Winter quarter)
<b>11.876 Solid-State Physics III</b>	Prep. 11.875, Solid State Physics II Electric, magnetic and thermal properties of matter.
Credits: 3 quarter hours.	(Offered 1967-68, Spring quarter)
<b>11.881 Quantum Theory of Fields I</b>	Prep. 11.836, Electromagnetic Theory and 11.844, Quantum Theory IV (may be taken concurrently)
Credits: 3 quarter hours.	(Offered 1967-68, Winter quarter)
<b>11.882 Quantum Theory of Fields II</b>	Prep. 11.881, Quantum Theory of Fields I and 11.845, Quantum Theory V (may be taken concurrently)
Credits: 3 quarter hours.	(Offered 1967-68, Spring quarter)
<b>11.883 Quantum Theory of Fields III</b>	Prep. 11.882, Quantum Theory of Fields II The content of the above three courses provide a study of the quantum mechanical one-particle wave equations for electrons, nucleons, neutrinos and mesons, symmetric and antisymmetric multiparticle systems, second quantization, free relativistic boson fields, fermion fields and electromagnetic fields, relation to the description of various elementary particles, theory of interacting fields and particles, formal scattering theory, Feynman diagrams, renormalization procedures, application to scattering, production and decay phenomena, quantum electrodynamic effects, recent formal developments.
Credits: 3 quarter hours.	(Offered 1968-69, Fall quarter)
<b>11.884 Particle Physics I</b>	Prep. 11.845, Quantum Theory V (may be taken concurrently)
Credits: 3 quarter hours.	(Offered 1968-69, Winter quarter)
<b>11.885 Particle Physics II</b>	Prep. 11.884, Particle Physics I
Credits: 3 quarter hours.	(Offered 1968-69, Spring quarter)
<b>11.886 Particle Physics III</b>	Prep. 11.885, Particle Physics II The content of the above three courses is a discussion of the properties of baryons, meson, leptons, and resonant states. The general phenomenological framework of the fundamental interaction between elementary particles. The implication of relativistic covariance, unitarity, analyticity, invariance and conservation laws. (Some knowledge of elementary quantum field theory is desirable but not required.)
Credits: 3 quarter hours.	(Offered 1967-68, Fall quarter)
<b>11.990 Special Topics in Physics</b>	Prep. Consent of the instructor A discussion of special topics in physics to be chosen by the instructor.
Credits: from 1 to 4 quarter hours.	(Offered yearly)

**11.991 Master's Thesis**

Experimental and theoretical work for master's degree.

Credits: 6 quarter hours.

(Offered yearly)

**11.992 Special Problems in Physics** Prep. Consent of faculty member

Theoretical or experimental work under individual faculty supervision.

Credits: from 1 to 4 quarter hours.

(Offered yearly)

**11.995 Doctoral Thesis**

Prep. Admission to Ph.D. program

Experimental and theoretical work for Ph.D. candidates.

(Offered yearly)



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